TABLE 1

Results of Skin Tests for Tumor Auto-antibodies in 290 Subjects

(First and Second Series)

	No. of Cases	First Series (1958)			No. of Cases	Second Series (1959A)		
		−	±	+		−	±	+
Volunteers	32	47%	22%	31%	—	—	—	—
Nontumorous diseases	33	67%	21%	12%	43	61%	16%	23%
Carcinoma	52	23%	6%	71%	42	26%	12%	62%
Other malignant tumors	6	34%	33%	33%	5	0	40%	60%
Benign tumors	6	17%	0	83%	15	13%	27%	60%
Hyperplasia and hyperkeratosis	8	12%	63%	25%	6	34%	16%	50%
? Recurrence	9	22%	0	78%	6	0	33%	67%
? Diagnosis	16	25%	12%	63%	11	27%	0	73%

TABLE 2

Results of Skin Tests for Tumor Auto-antibodies in 204 Subjects

(Third Series)

	No. of Cases	Original Test			Trypsin Modification			Combination of Both		
		−	±	+	−	±	+	−	±	+
		%	%	%	%	%	%	%	%	%
Volunteers	65	86	11	3	55	20	25	51	21	28
Nontumorous diseases	46	76	13	11	70	19	11	54	31	15
Carcinoma	35	31	23	46	3	20	77	3	11	86
Other malignant tumors	6	0	17	83	17	17	66	0	17	83
Benign tumors	12	8	25	67	17	33	50	0	17	83
Hyperplasia and hyperkeratosis	5	40	60	0	40	60	0	20	80	0
? Recurrence	13	38	8	54	23	0	77	15	0	85
? Diagnosis	22	36	23	41	5	18	77	5	9	86

significant (regarding therapy) as in the early cases. Therefore, the failure of the skin test to detect 34 per cent of carcinomas in the late stages is not serious from the clinical point of view.

Since, however, we are interested in the basic processes underlying these clinical manifestations of tumor, we could not help but ask ourselves why should carcinomas with metastasis behave this way? How could we modify the test to eliminate this drawback?

Before attempting to modify the test, we studied a second series of 128 subjects, using the same routine method as in the first series. For comparative purposes we used one figure for all carcinomas. It will be noted in Table 1 that both series yielded comparable data. In subjects with nontumorous diseases 67 per cent showed negative results in the first series as compared to 61 per cent in the second series; whereas in patients with carcinomas, 23 per cent showed negative results in the first series as compared to 26 per cent in the second.

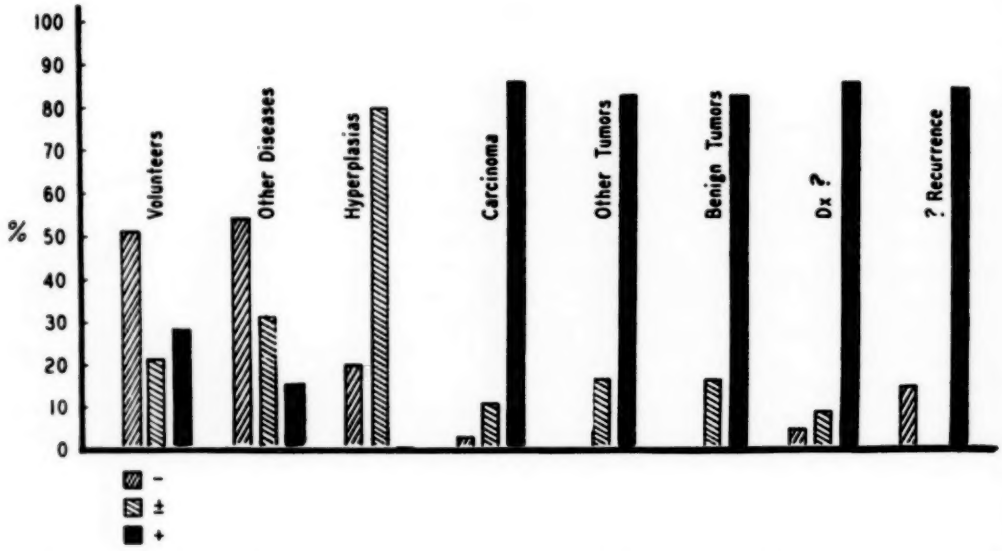


FIG. 1. Results of skin tests for tumor auto-antibodies in 204 subjects simultaneously tested with the original and the modified trypsin method.

In subjects with malignant tumors other than carcinoma and in those with benign tumors the findings were negative in 34 per cent and 17 per cent respectively in the first series, and in 0 per cent and 13 per cent respectively in the second series.

The results in both of these series, we thought, could be improved. An attempt was thus made to modify the procedure so as to obtain a greater degree of sensitivity.

Tumor skin test in 204 subjects—modified trypsin method (third series)

Results of the T.S.T. on 204 subjects in whom both the modified trypsin method and the original method were simultaneously used, are listed in Table 2.

It may be seen that with the trypsin method only 3 per cent of the carcinoma patients showed negative results; in 20 per cent the results were doubtful and in 77 per cent they were positive. With the original T.S.T., in 31 per cent of the patients the findings were negative, in 23 per cent doubtful, and in only 46 per cent positive.

In patients with malignant tumors other than carcinoma and those with benign tumors, the findings were negative in 17 per cent each with the trypsin method as compared to 0 per cent and 8 per cent respectively when the original procedure was used. In normal subjects and those with nontumorous diseases, 55 per cent and 70 per cent respectively showed negative results with the trypsin method, and 86 per cent and 76 per cent respectively with the original method.

When, however, a combination of both methods was used (a procedure we have since adopted routinely), the T.S.T. findings were negative in only 3 per cent of patients with carcinoma, and in none of those with other malignant and benign

TABLE 3

Results of Skin Tests for Tumor Auto-antibodies in 42 Cases with a Questionable Clinical Diagnosis of Carcinoma, Followed for One Year

Tumors			Other Diseases		
−	±	+	−	±	+
3 cases 11%	2 cases 7.5%	22 cases 81.5%	12 cases 80%	1 case 7%	2 cases 13%

tumors. In normal subjects, and in patients with nontumorous diseases, negative results were obtained in 51 per cent and 54 per cent respectively. These data are shown in Table 2 and in Figure 1.

Another marked advantage of the trypsin method is its transformation of the test so that both immediate and delayed reactions can be observed.

Tumor skin test in 42 cases with a questionable clinical diagnosis of carcinoma

For this study 42 cases with a questionable clinical admission diagnosis of carcinoma were used. These patients were tested immediately, and the results were reported within twenty-four hours on the patients' medical records. At the conclusion of the study, the case records were reviewed and an attempt was made to correlate the final pathologic diagnosis with the T.S.T. findings on admission.

Table 3 shows these results. Of the 42 cases, 27 were later proved to be tumors, and 15 were proved to be nontumorous disease. Only 3 patients (11 per cent) showed a negative result with the T.S.T. in the presence of tumor. This group comprised: a patient with carcinoma of the endometrium who died five days after the test; a patient with a carcinoma of the rectum that was found to be inoperable; and a patient with prostatic carcinoma reported to be of low-grade malignancy, who also had allergic dermatitis at the time of testing. The first two were cases of advanced disease; the third case raises an interesting question in regard to microscopic diagnosis. Where does prostatic hypertrophy end and prostatic carcinoma begin? Could the allergic dermatitis have interfered with the reading of the T.S.T. by inducing local histamine depletion?

Of the 15 patients with nontumorous disease, 2 had positive reactions with the skin test. One of these 2 was a 60-year-old patient with ascites and an abscess in the right upper lobe of the lung with bronchopneumonia; the other was a 56-year-old patient with jaundice in whom the postoperative pathologic diagnosis was chronic cholecystitis and cholelithiasis. Could these 2 subjects be harboring a small tumor (whether benign or malignant) elsewhere in the system? Could the abscess in the lung represent an attempt on the part of the body to eliminate a tumor there? Could this attempt have succeeded partially so that a tumor was not apparent microscopically but was still active from a submicroscopic point of view?

Tumor skin test and some difficult diagnostic problems

Six of these difficult diagnostic problems will be described.

Case 1. W. H., a 66-year-old female, was admitted to the hospital on June 29, 1959, for study. The only suggestive finding was slight loss of weight. There were no other signs or symptoms. The tumor skin test (T.S.T.) was performed on June 30, 1959; the results were reported as positive. With this in mind a thorough search for abnormalities was attempted by radiographic and clinical laboratory testing. All findings were negative. The patient was discharged, only to be readmitted on October 5, 1959, with signs of intestinal obstruction. At operation a few metastatic nodules were seen in the liver. One of these nodules was removed and identified pathologically as adenocarcinoma. Owing to the presence of adhesions, the surgeon could not locate the primary focus.

Case 2. W. H., a 37-year-old male, was admitted on May 11, 1959. The diagnosis was phlebitis and pulmonary embolism. At the time of admission he was quite ill and required oxygen therapy. Results of a T.S.T. performed that day were positive. The patient began to improve clinically. On June 12 and on July 1 biopsy specimens of two lymph glands were obtained; no tumor tissue was seen microscopically. Examination of another biopsy specimen and a Papanicolaou smear taken from bronchoscopy material on July 1 also yielded negative findings.

The attending physician then requested repetition of the T.S.T. On July 13 this second T.S.T. also showed a positive reaction. The pattern indicated a spread of tumor beyond its origin. On July 17, 1959, the physician noted a point of tenderness over the lower thoracic vertebrae. Needle biopsy was performed, and metastatic carcinoma was reported by the pathologist. The patient died, and at autopsy it was found that the primary tumor was a bronchogenic carcinoma of the left lung with metastatic lesions to the lungs, brain, heart, adrenals and liver.

Case 3. F. D. was a woman aged 64. When admitted there was the possibility that she had an abdominal neoplasm. On July 28, 1958, the results of the skin test were positive. On August 7, an exploratory laparotomy revealed a subphrenic abscess. A kidney was removed by the surgeon and reported to be normal by the pathologist. There was then some doubt in the mind of the surgeon as to the accuracy of the T.S.T. On August 9, 1958, the patient died and at autopsy an adenocarcinoma of the liver was found.

Case 4. M. Z., a woman aged 88, was admitted with possible intestinal obstruction. On January 7, 1959, the reaction to the T.S.T. was positive. On January 23, the intestinal obstruction was found to be due to fecal impaction. On April 19, jaundice was observed and was thought to be due to cholelithiasis. On May 3, 1959, a laparotomy was performed and a carcinoma of the ampulla of Vater was found (confirmed pathologically).

Case 5. R. P. was a woman aged 43. On admission the tentative diagnosis was anemia. On August 4, 1958, the T.S.T. reaction was positive. It was noted that the patient was febrile. No definite diagnosis could be made of her condition. At autopsy on September 3, 1958, a retroperitoneal sarcoma with metastasis was found.

Case 6. J. S., a 66-year-old painter and hospital employee volunteered for a skin test. On September 16, 1958, the T.S.T. reaction was positive, but this was not disclosed to the subject. He continued in apparently good health. On September 25, 1959, he observed a mass on the right side of the neck. This mass increased in size until at the time of the last examination it measured 7 cm. x 7 cm. A diagnosis of carcinoma of the larynx with metastasis to the cervical glands was confirmed by laryngeal biopsy on November 13, 1959.

Tumor skin test in relation to recurrence of tumors

Table 4 shows 10 cases of surgically treated malignant tumors in which the problem of recurrence was involved. In those patients in whom the reaction to the T.S.T. was positive (some time after surgery), pathologically confirmed re-

TABLE 4

Results of Skin Tests in 10 Cases in Which There Was a Question of Recurrence of a Malignant Tumor

Patient		Primary Site of Tumor	Results of Skin Test	Presence or Absence of Recurrent Tumor	Time Interval	
Initials	Age (yrs.)				Between surgical removal of primary lesion and skin test (mos.)	Between skin test and final confirmation (days)
J. D.	69	Ca. sigmoid	+	+ (colon)	12	1
G. H.	11	Cerebellar astrocytoma	+	+ (brain)	48	4
I. B.	33	Basal-cell Ca. of eyelid	−	*−	½	(510)†
M. S.	76	Ca. breast	+	+ (Ca. stomach)	118	300
V. R.	44	Ca. breast	+	+ (lymph gland)	2½	210
L. P.	50	Ca. lung	+	+ (thoracic wall)	66	60
C. F.	53	Ca. rectum	+	+ (muscle)	72	7
H. M.	60	Ca. colon	+	+ (liver)	26	60
J. M.	43	Ca. colon; "polyp"	−	−; no malignancy at site of resection	2	8
A. VB.	69	Ca. ureter	−	−; no evidence of recurrence	4	8

* Case in which final diagnosis was made on clinical and laboratory grounds only. In all other cases there was pathologic confirmation as well.

† Time interval following skin test in a patient who still had no recurrence.

currences of the malignant tumors developed later. The time interval between surgical removal and the test varied from ½ to 1⅛ months. The interval between the skin test and final confirmation varied between 1 and 300 days.

In one interesting patient, M. S., who had had carcinoma of the breast nine years before and who was believed cured, the T.S.T. reaction was positive; three hundred days later, there was x-ray and clinical evidence of gastric tumor with metastasis.

Patients in whom there was no reaction to the tumor skin test did not show any evidence of recurrence. Patient I. B. has now been followed for 510 days and is tumor-free.

Influence of surgical removal of tumor on the tumor skin test

In Table 5, data are listed on 3 patients from whom blood samples were taken before and after operation. They were tested after operation simultaneously with both preoperative and postoperative sera. Results of the tests were then correlated with the extent of tumor spread, as judged by the surgeon at the operation.

In 2 cases in which tumor spread was detected by the surgeon, both preoperative and postoperative sera gave positive results with the T.S.T. In a patient with an early carcinoma of the lung, in whom the surgeon could not find any evidence of

TABLE 5

Influence of Surgical Removal of Tumor on Skin Tests

	Serum-SS*			Trypsinized Serum-SS						Tumor Spread
				Immediate reaction			Delayed reaction			
	Ca.	F.S.	L.	Ca.	F.S.	L.	Ca.	F.S.	L.	
M. S.—Nephrectomy for adeno-Ca. of kidney:										
Before op. removal	1.49	1.25	2.27	1.61	2.10	1.24	1.0	0	0	+
After op. (10 days)	.75	.97	1.02	1.54	1.43	1.56	.57	1.28	.57	
F. W.—Pneumonectomy for oat-cell Ca. of lung:										
Before op. removal	1.70	1.48	1.85	1.27	1.18	.91	.80	1.70	1.40	−
After op. (4 days)	.97	.80	.87	.97	.71	.71	1.10	.85	1.00	
A. DM.—Pneumonectomy for oat-cell Ca. of lung:										
Before op. removal	1.04	1.61	.78	1.53	1.17	1.40	.76	.44	.88	++
After op. (4 days)	1.50	1.50	1.00	1.48	1.22	.91	.28	.42	.67	

* Values indicate ratio of serum–SS to serum alone.
Ca. = Carcinoma; F.S. = Fibrosarcoma; L. = lymphoma.

TABLE 6

Results of Skin Tests (Combined Method) for Tumor Auto-antibodies in Relation to "Gastric Ulcer" in the Aged

	Patients		Results of Skin Tests—Combined Method		
	Number	Mean age (yrs.)	−	±	+
Older than 40 years					
Gastritis or gastric ulcer					
A. Second series	8	61	38%	0	62%
B. Third series	11	61	27%	18%	55%
C. Both series	19	61	31.5%	10.5%	58%
Diseases other than gastritis or tumor					
A. Second series	21	65	62%	14%	24%
B. Third series	20	60	70%	30%	0
C. Both series	41	62.5	66%	22%	12%
? Gastric ulcer or gastric carcinoma	7	70	0	0	100%
Younger than 40 years					
Gastritis or ulcer	10		60%	40%	0
Other nontumorous diseases	24		71%	25%	4%

carcinoma spread, the preoperative serum gave a positive result with the T.S.T. whereas the postoperative serum (tested at the same time) gave a negative result.

Tumor skin test in relation to "gastric ulcer" in the aged

In our first series (2) there was an elderly patient with "gastric ulcer" in whom the reaction to the skin test was positive. An earlier surgical biopsy was reported as showing gastric carcinoma. However, this was not confirmed when the stomach was removed and only an ulcer was found. Could this represent a cure, as viewed microscopically? Could it indicate a state of tumor activity on the submicroscopic level?

Since then we have collected 19 cases with a diagnosis of "gastric ulcer" in patients older than 40 (mean age, 61 years). These data are recorded in Table 6. In these patients, results of the T.S.T. were positive in 58 per cent, doubtful in 10.5 per cent and negative in only 31.5 per cent.

In the same period 41 patients were studied who had nontumorous disease and no evidence of gastric ulcer. The mean age of these subjects was 62.5 years. In this group, the results of the T.S.T. were positive in only 12 per cent, doubtful in 22 per cent and negative in 66 per cent.

Seven other patients (mean age, 70 years) in whom gastric carcinoma was suspected all showed a positive reaction with the T.S.T.

In a control group of subjects younger than 40, of whom 10 had gastric ulcer and 24 had nontumorous disease without gastric ulcer, the results of the T.S.T.

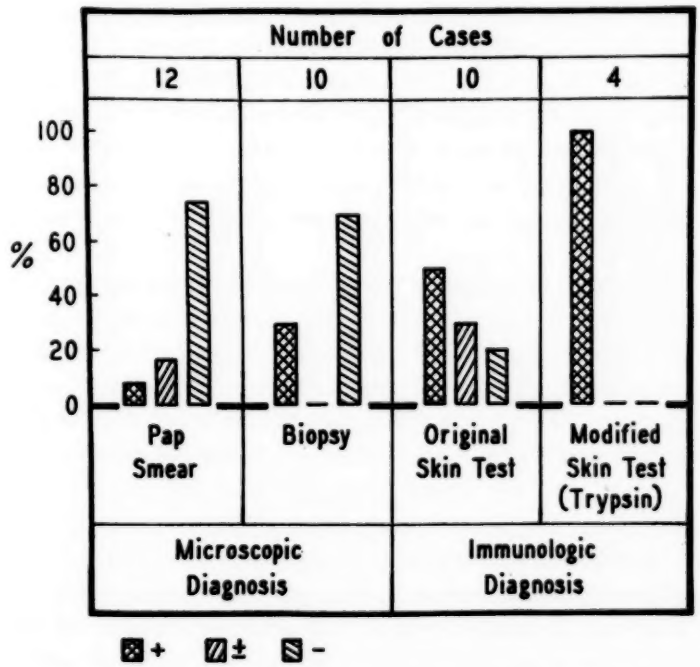


FIG. 2. Microscopic versus immunologic diagnosis

were positive respectively in 0 per cent and 4 per cent; doubtful in 40 per cent and 25 per cent; and negative in 60 per cent and 71 per cent.

Immunologic versus microscopic diagnosis

The data presented in Figure 2 were too few to warrant definite conclusions. However, there were interesting trends. Thirty-six subjects underwent either the original T.S.T. or the modified trypsin T.S.T. In addition, either a Papanicolaou smear or a biopsy specimen was examined. The diagnosis of carcinoma in all these cases was later confirmed microscopically on surgical specimens.

The Papanicolaou smear indicated tumor in only 8 per cent of the 12 cases tested, whereas biopsy showed tumor in 30 per cent of the 10 cases tested. T.S.T. findings were positive in 50 per cent of the 10 cases tested with the original method and in 100 per cent of the 4 cases tested with the modified T.S.T.

DISCUSSION

Our previous study showed that in cases of early carcinoma a positive reaction to the T.S.T. was elicited in practically all of the patients. In the late metastatic cases, however, the percentage of positive reactions was much lower. This poses a challenging situation. It suggested to us the possibility that the reactive sites of the antibodies in the latter cases are probably covered by some other protein molecules. Could we liberate these "imprisoned" antibodies in order to free their reactive sites?

Pope (9) had found that antibodies are readily split by digestion with proteolytic enzymes into an active portion and an inactive portion. Furthermore, Northrop (10) had reported the preparation of diphtheria antitoxin in a form which satisfied the criteria for a pure protein, by digesting away the toxin of a toxin-antitoxin precipitate with trypsin. This suggests that trypsin might be able to digest away some unwanted serum components, thus liberating the reactive sites on these antibodies. If so, when such free antibodies combine with their polysaccharide antigens, the resulting complexes might be more effective in inducing a positive reaction to the T.S.T.

The results reported for our third series showed this to be the case. We not only increased the sensitivity of the tumor skin test by the use of trypsinized serum, but also modified the skin reactions to such an extent that both immediate and delayed responses were obtained.

It is of interest that although trypsin increased the sensitivity of the procedure by changing a false negative result into a positive result, it was apparent that not all the false negative T.S.T. findings were due to this phenomenon. Some seemed to be due to exhaustion of antibody-producing mechanisms, which is probably at the basis of the difference in patterns observed.

In cases of early localized tumors, for example, the reactions for all 3 S.S.-Ab. complexes are positive; in cases of tumor extension, for only 2 out of the 3 (the carcinoma S.S.-Ab. response having disappeared); and in cases with metastasis, for only 1 out of the 3 (lymphoma S.S.-Ab.). We have utilized these patterns diagnostically as an indicator of whether a tumor is early, whether it has extended locally, or whether it has metastasized to distant organs.

This use of trypsin is of practical as well as academic interest. The delayed reactions which result from the use of such trypsinized sera are distinct and easy to read. They last for twenty-four to forty-eight, and even to seventy-two hours, in contradistinction to the immediate reactions which are only of brief duration. The more basic aspect of the role of trypsin in eliciting delayed reactions of the hypersensitivity type in the presence of antigen-antibody complexes and the basic mechanisms underlying the T.S.T. will be reported elsewhere.

It is apparent from our immunologic studies with both the blood test and skin test, that we may need to change radically some of our present concepts in regard to tumors and host-tumor interactions.

Our earlier studies involving the detection of protective antibodies to tumors, using only S.S. intradermally (2), convinced us that cancer is not a disease of the "cancer age group" alone. We are confronting cancer from birth (or even earlier) to death.

This means that every one of us is at war with this disease. It also means that one may expect all grades of host responses ranging from the presence of immunity indicated by protective antibodies to S.S. alone, to the presence of "auto-hypersensitivity" as indicated by the finding of immediate and delayed hypersensitivity reactions to the subject's own antibodies when these are allowed to form a complex with specific polysaccharide (S.S.) antigens.

This indicates that the prevalence of cancer and tumors, especially in the subclinical phases, is greater than we have been led to believe. It should also emphasize the possibility that early cancerous changes may be reversible and that the body defenses in many of us, without any external indication, are winning their battle against cancer, or at least have obtained "definite promises of non-interference" from the tumors.

Hudson *et al.* (12) thoroughly studied 300 males by means of routine surgical biopsies of the posterior prostate; they detected a total of 39 adenocarcinomas (13 per cent). The distribution according to age was as follows: 4.2 per cent at 40–49 years; 12.9 per cent at 50–59 years; 16.1 per cent at 60–69 years; and 16.9 per cent at 70–79 years.

Peterson (13) reported 212 cases of precancerous cervix; in 124 there was epithelial hyperplasia with nuclear abnormalities, and in 88 a condition suggesting invasion in addition. Of these 212 patients, 127 were followed at regular intervals. Clinical cancer developed in 34 after periods varying from a few months to ten years. At the end of the first year cancer had developed in only 4 per cent; in approximately half of the total cases there were no further histologic changes; in the remainder the abnormalities had regressed.

The fact that so many of these early lesions regress indicates the substantial number we would overlook if we base our estimate of the prevalence of the disease on only the definite manifestations. This has an important bearing on our efforts to evaluate critically the early diagnostic or screening tests for tumors.

It also indicates that the great majority of these abnormal changes take place at least fifteen years before carcinoma may become manifest *e.g.*, around 30 years of age. In such cases, should a cancer test have been performed fifteen years earlier, the results would all have been considered false positives. It may be more

than mere coincidence that in our first series we found a higher percentage of positive reactors to the T.S.T. among the younger volunteers (31 per cent) than among the older patients with nontumorous diseases (12 per cent). In our second series no volunteers were studied, but in our third series this finding was confirmed; the younger volunteers showed 28 per cent positive reactions as against 15 per cent in the older subjects with nontumorous diseases.

Since the T.S.T. is for tumor screening and not for carcinoma diagnosis (as is the blood test (3, 6)), and since it is possible that many subjects have silent benign tumors (*e.g.*, fibroids or polyps), it is not surprising to find a relatively high percentage of positive test reactions among the so-called "normal" subjects.

Dunn (14) clearly made this differentiation between a diagnostic and a screening test. In commenting on the use of exfoliative cytology he says: "Since exfoliative cytology in the method proposed here is a screening procedure, it is important that emphasis be placed on reducing false-negative reports to a practical minimum, and not on diagnostic accuracy in terms of the final histopathological findings." This is why we modified the T.S.T. so that it elicited, in this series, only 3 per cent false negative results for carcinoma and no false negative results for benign tumors and other malignant tumors.

Another new concept is that "gastric ulcer" in the aged, although it represents a different clinical manifestation than tumor, may basically be a related phenomenon (Fig. 3). The finding of positive T.S.T. reactions in 58 per cent of these cases compared to only 12 per cent in nontumorous subjects without gastric ulcer, seems to be convincing evidence.

One more aspect should be mentioned, namely, the significance that should be attached to a positive T.S.T. reaction. What does it mean in terms of basic physiologic mechanisms and what does it mean from a clinical point of view? A positive T.S.T. reaction should indicate the presence of a state of auto-hypersensitivity in which the host is producing auto-antibodies against the complexes being formed by his own antibodies and certain tumor polysaccharide antigens.

The presence of such a state of auto-hypersensitivity represents an abnormal host response on the submicroscopic level, regardless of the age of the subject. In the event that such activity continues unabated and the host's own protective mechanisms wane, this abnormal host response could become manifest on the microscopic level, and later on the clinical level in the form of tumor.

In the younger age groups the host protective mechanisms are more effective, and thus this abnormal host response is probably checked in many instances before it can reach the microscopic and clinical levels. In some instances it might reach the tumor stage.

In the older age groups, however, the host protective mechanisms are much weaker and thus the chances are increased that this abnormal host response will reach the microscopic and clinical levels and manifest itself in the form of tumor.

In healthy younger persons, a positive T.S.T. reaction indicates a susceptibility to tumor, whereas in healthy older persons a positive T.S.T. reaction indicates the presence of either a precancerous lesion or a latent tumor.

In older persons, however, if even the earliest symptoms or signs suggestive of

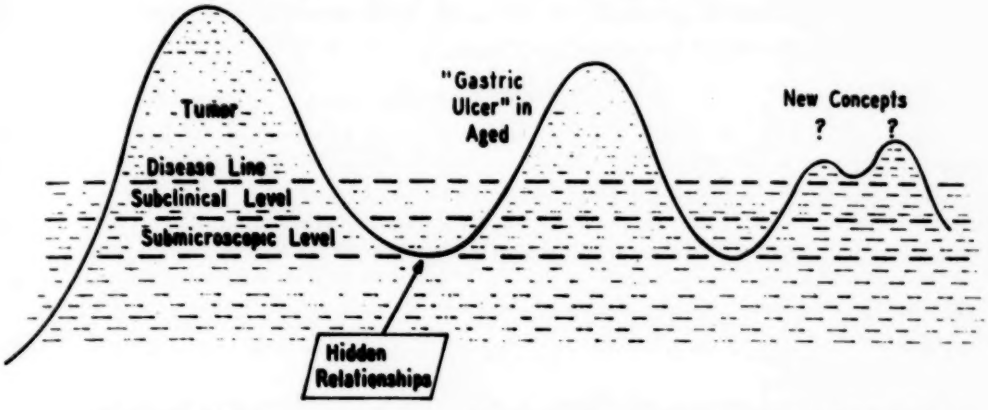


FIG. 3. Possible relationship between tumor and "gastric ulcer" in the aged

tumor are present, a positive T.S.T. reaction assumes a grave significance. It indicates the presence of a tumor in its active stage.

Thus two factors are presented which are of significance in our efforts to combat cancer. The first is the long latent or incubation period between the development of a state of auto-hypersensitivity (as detected by the T.S.T.) and the development of tumor. The second is the ease with which the T.S.T. detects early malignant tumors. In view of the long latent period, chemoprophylaxis assumes vast importance in prevention of the disease. With use of the tumor skin test, early diagnosis and early intervention will improve the treatment of cancer.

SUMMARY

A tumor skin test (T.S.T.) is described which is based on the detection of an auto-hypersensitivity to the subject's own antibodies when these are allowed to form complexes with cancer polysaccharides. An earlier study on 191 subjects has been extended to include two new series of 332 additional cases.

The T.S.T. was modified by the use of trypsinized serum. This increased the sensitivity of the procedure and resulted in the appearance of both immediate and delayed hypersensitivity reactions.

Using both the original method and the modified trypsin method simultaneously, the usefulness of the T.S.T. as a *screening procedure* for tumors was markedly enhanced, as shown in our studies on 204 subjects in the third series. Among the patients with carcinoma, the results of the T.S.T. were negative in only 3 per cent, doubtful in 11 per cent, and positive in 86 per cent. Among the subjects with tumors other than carcinoma or with benign tumors, the T.S.T. results were negative in 0 per cent, doubtful in 17 per cent, and positive in 83 per cent.

In cases involving difficult diagnostic problems and cases in which tumor is suspected clinically but cannot be proved, the T.S.T. is of value in confirming the neoplastic nature of the disease. This test is also of assistance in detecting recurrence of tumor after surgery or radiotherapy.

Some of our findings, such as the observation that "gastric ulcer" and tumors

are probably related phenomena in the aged, indicate that new concepts should be formulated in regard to cancer and tumors.

Acknowledgments

The author wishes to thank Mrs. Mary Frances Opp for excellent technical assistance and Mr. Edward J. Dailey, Jr. for editorial assistance. He also wishes to thank the Board of Governors of Muhlenberg Hospital for providing an optimal environment for research, the physicians at Muhlenberg Hospital for their wholehearted cooperation, and all the volunteers and patients without whose help this work would not have been possible.

This investigation was supported in part by a grant from Johnson and Johnson and also from the Leo H. Salvati Cancer Research Fund of Muhlenberg Hospital.

REFERENCES

1. Makari, J. G.: Detection of cancer antibodies and auto-antibodies by an intradermal reaction with a review of the detection in human serum of cancer antigens by the Schultz-Dale method, (abstract) *Am. J. Pub. Health 49:* 687, 1959.
2. Makari, J. G.: Recent studies in the immunology of cancer. III. Detection of cancer antibodies and auto-antibodies by an intradermal reaction, with a review of the detection in human serum of cancer antigens by the Schultz-Dale method, *J. Am. Geriatrics Soc.* **8:** 16, 1960.
3. Makari, J. G.: Detection of a soluble antigen in the serum of cancer patients by use of the Schultz-Dale test, *Brit. M. J.* **2:** 1291, 1955.
4. Makari, J. G.: Detection of antigens in sera of patients with neoplastic disease by Schultz-Dale test. Its possible use as a screening procedure for tumors, *Brit. M. J.* **2:** 358, 1958.
5. Burrows, D.: Schultz-Dale test for detection of specific antigen in sera of patients with carcinoma, *Brit. M. J.* **1:** 368, 1958.
6. Makari, J. G.: Some recent studies in the immunology of cancer. I. Detection of methylcholanthrene-like substance by the Schultz-Dale method in the sera of patients with tumors and in some apparently healthy persons, *J. Am. Geriatrics Soc.* **7:** 611, 1959.
7. Makari, J. G.: The polysaccharide behavior of cancer antigens, *Brit. M. J.* **2:** 355, 1958.
8. Makari, J. G.: Recent studies in the immunology of cancer. II. Demonstration of antibodies to cancer polysaccharides and to polysaccharide-antibody complexes by an intradermal reaction, *J. Am. Geriatrics Soc.* **8:** 4, 1960.
9. Pope, C. G.: Action of proteolytic enzymes on antitoxins and proteins in immune sera, *Brit. J. Exper. Path.* **20:** 132, 201, 1939. Preparation of diphtheria antitoxin in state of high purity, *Ibid.*, p. 213.
10. Northrop, J. H.: Purification of diphtheria antitoxin, *Science* **93:** 92, 1941.
11. Makari, J. G.: Delayed hypersensitivity and cancer. (To be published.)
12. Hudson, P. B.; Finkle, A. L.; Hopkins, J. A.; Sproul, E. E., and Stout, A. P.: Prostatic cancer. XI. Early prostatic cancer diagnosed by arbitrary open perineal biopsy among 300 unselected patients, *Cancer* **7:** 690, 1954.
13. Peterson, O.: Pre-Cancerous Changes of the Cervical Epithelium in Relation to Manifest Cervical Carcinoma. Copenhagen, Danish Science Press Ltd., 1955.
14. Dunn, J. E.: The relationship between carcinoma *in situ* and invasive cervical carcinoma, *Cancer* **6:** 873, 1953.

THE COMPLEX NATURE OF CANCER*

FRANK S. BUTLER, M.D.†

Columbus Hospital, New York, N. Y.

The importance of cancer arises not only from its position as the major medical problem of today but also from its social impact. This disease can influence the entire social, economic and psychologic life of a family.

Many times the physician sees a large family group gathering around an older member with hopeless cancer, tapping most of their financial resources for treatment, spending most of their time in nursing services, and living under the strain of the progressive degeneration of the patient. Even after death intervenes, the cancer problem remains with the patient's family, as they begin to fear for their own health. For example, after a laryngectomy has been performed, one may expect fearful visits from several members of the family to check throat symptoms. All these factors must be considered when assessing the importance of the cancer problem and the corresponding tremendous responsibility placed upon the medical profession as the group to whom falls the task of combating this dread disease.

Since the importance of the problem of cancer is so obvious, what are the main factors that have made progress so frustratingly slow?

THE COMPLEXITY OF CANCER

The most important factor is the complexity of cancer. It is such a unique disease that it defies definition. Years ago James Ewing (1, 2), the father of tumor pathology, suggested the following: "Cancer is an autonomous growth of cells without control or restraint and performing no useful function."

Many exceptions to this definition can now be demonstrated. In the first place, cancer is not autonomous, since some tumor tissue requires at least as much blood for its nutrition as does any normal tissue of the body. As proof of this, several cases of cancer of the lower extremity have been treated successfully by a "strangulation" technique (being studied by Dr. Frederic Allen, now in Vienna).

Secondly, restraining influences can be observed at work in many cancers. For instance, in scirrhous carcinoma of the breast there is much fibrous tissue—a pathologic finding which suggests a form of resistance or immune response by the body in an attempt at localization.

In the third place, many cancers exhibit functioning tissue. The granulosa-cell cancer of the ovary (3) prolongs the menstrual period in the female, and certain well known pancreatic tumors can produce hypofunction or hyperfunction of the pancreas (4, 5).

* Presented at the 1959 Annual Meeting of the Medical Adviser's Group of the Selective Service System, U. S. Government. Medical Director, Gabriel Kirschenbaum, M.D.

† Director, Tumor Department.

Since cancer is so complex that it can hardly be defined, it is not surprising that it does not behave like a single disease. Clinically, it appears to be a kaleidoscope of confused symptoms, obscure signs, and eccentric pathogenesis.

Since the fundamentals are so poorly understood, there is a natural tendency to oversimplify when diagnosing cancer. Recently I overheard a doctor informing a locker-room group of physicians regarding a case he had just diagnosed. He stated: "The cancer involved the sigmoid and occupied one-half of the diameter but there were 'no glands' and the prognosis is excellent." I was astounded by the apparent lack of comprehension of the true nature of what had been found. If the tumor were half the diameter of the sigmoid, statistics alone would supply the information that the growth had probably been in existence for six months. Since there are no such glands in this area, the reference should have been to metastatic nodes. The true evaluation should have been postponed until after the histopathologic study had been completed. The stated prognosis was nothing more than a haphazard guess. This physician might not have been so glib with his diagnosis if he had been more aware of the truly staggering complexity of cancer.

To illustrate this complexity more definitely, the following is a partial list of the innumerable and varied types of cancer:

1. *Histologically benign and only locally malignant*

Histologically, these tumors are benign. Because of their location, however, when left untreated they can enlarge to the point where they cause damage and interfere with respiration and nutrition. They may even invade the cranium and cause death. Such a tumor is the ameloblastoma (6); if untreated it will expand to tremendous size. Another is the naso-pharyngeal angiofibroma occurring in adolescent boys; it has been known to invade the skull.

2. *Histologically benign, with malignant evolution*

Certain tumors described as histologically benign will sometimes metastasize and act pathogenetically as malignant tumors in spite of the fact that the metastatic deposits present a benign histologic picture. Some examples are: *a*) benign metastasizing struma of the thyroid (7); *b*) giant-cell tumor of bone, which can be extremely deceiving in this respect as pointed out by Morton (8) in his excellent article; and *c*) the mixed tumor of salivary origin (9).

3. *Benign lesions with potentialities for malignant degeneration*

These should be regarded as precancerous conditions (10), that is, lesions in which it can be predicted that cancer will appear more frequently than in normal tissue. Some examples are leukoplakia of the oral cavity, and chronic radiation dermatitis with subsequent atrophy and telangiectasis.

4. *Benign tumors in which the incidence of malignancy is high*

There are innumerable examples of these precursors of carcinoma (11). Two that come most readily to mind are: *a*) the junctional nevus, which tends to be-

come a malignant melanoma, as do some moles after puberty and during pregnancy (Pack (12)); and *b*) polyps of the colon and slumbering mammary fibroadenomas of long duration, reported by Ackerman and del Regato (11).

5. *Carcinoma in situ*

This lesion is recognized histologically as cancer but shows no invasive properties. The histologic picture is demonstrable at numerous sites throughout the body. Bowen's disease of the skin is included in this category (13, 14).

6. *Cancer confined to local spread*

These malignant tumors confine themselves closely to the primary site. Many intra-oral cancers do not extend beyond the neck, and it is not unusual for death to occur from an advanced cancer which has extended only locally or with regional metastases. In such a case, at autopsy, it is found that death was due to massive disease in the head and neck, with no evidence of malignant disease below the clavicles. The majority of patients with cancer of the cervix die from renal insufficiency due to obstruction of the ureters from local extension of the cancer.

7. *Primary cancer with metastases*

This is the most frequent form of cancer. Clinically, the course can be predicted to a certain extent. Primary renal cancer usually spreads to bone, and primary gastric cancer metastasizes to the liver; on the other hand, primary lung cancer may spread eccentrically. There are numerous variations in the method of spread of primary cancer. Metastases may occur through local extension by way of the blood or lymphatics. Predictions can be made with no great certainty. For example, whereas an osteogenic sarcoma (14, 15) can be expected to travel through the blood stream to the lungs, and an epidermoid carcinoma to spread by way of the lymphatics to the neck, a malignant melanoma will use both avenues for its unpredictable spread.

8. *Multiple primary cancer*

Multiple primary cancer may be: 1) synchronous, when the tumors occur simultaneously, or 2) metachronous, when there is an interval between their occurrences. It is difficult to prove that multiple cancers are primary because, unless the histologic appearances are distinctly different, the tumors could well be a primary lesion and a metastasis. The histologic variations of epidermoid carcinoma of the buccal mucosa can be easily distinguished from adenocarcinoma of the stomach; thus, when both tumors are found in the same patient, the diagnosis of multiple primary cancer can be confirmed. However, it would be much more difficult to prove this diagnosis in a patient exhibiting both lung cancer and thyroid cancer—conditions in which the histologic features are closely related. The distribution of multiple primary cancer may be less eccentric than that of single primary cancer; for instance Paquin and Roland (16) observed

a carcinoma of the nasopharynx that metastasized to the penis—an example of extreme spread by a primary cancer.

The incidence of multiple primary cancer is reported to be as high as 15 per cent and, surprisingly, the additional primary tumors are more frequently found in the same system. In my series of breast cancer, 6 per cent of the patients had another primary tumor elsewhere, but 3.6 per cent of these had the other cancer in the opposite breast. Furthermore, a large percentage of the other primary cancers occurred in the ovary and uterus.

9. *Cancer of multicentric origin*

This is an arbitrary group but it emphasizes the complexity of cancer as a disease (17). In such cases the specific normal tissue is widely distributed in the body and the cancer involves this type of tissue wherever it is situated. Multiple myeloma is perhaps one of the best examples; biopsy of the bone marrow should confirm the diagnosis. On the other hand, in the exceptional case of solitary myeloma the diagnosis can be made only by local examination; however, this condition is considered a precursor of the more usual disseminated type. Other examples are the leukemias and the lymphomas (such as lymphosarcoma), involving lymphatic tissue. These are generally conceded to be multicentric in origin, although a few workers do not accept this view. Occasionally the rare localized form is observed.

10. *Anaplastic carcinoma*

This is the highly malignant and rapidly invasive form of carcinoma which rarely can be treated successfully no matter when the diagnosis is made. Histologic examination reveals loss of differentiation and organization and no control of growth and dissemination. Unfortunately, any tissue of the body may be involved with this type of cancer.

RELATIONSHIP OF COMPLEXITY TO CERTAIN ASPECTS OF THE CANCER PROBLEM

Such complexities as the foregoing often account for varied interpretations of the results of therapy. It is pertinent, therefore, to examine more fully the relationship of the complexity of cancer to certain social aspects of the cancer problem.

Medico-legality

Pack and Ariel (18) quote the proverb "In dubio semper pro laeso" (when in doubt always favor the injured). This concept apparently achieves precedence over fact based on experiment and experience in many cases. The sympathy of judge and jury toward a patient afflicted with a malignant tumor, abetted by the testimony of well-meaning but ill-informed physicians, results in many verdicts favorable to the plaintiff. This has developed to the extent that insurance companies are loathe to present a case before a jury and consequently settle many

cases out of court prematurely. This is obviously a serious situation which will continue unless the complex nature of cancer is unscrambled.

I have been told of one pathologist who avoids reading frozen sections for fear of medico-legal action. Many surgeons dread performing a radical mastectomy without a biopsy on a patient with a clinically obvious breast cancer for the same reason, yet most surgeons agree that this procedure is preferable to cutting into a tumor for a biopsy specimen in order to justify the diagnosis histologically.

Treatment

There can be no clear-cut pattern of therapy in a disease as complex as cancer. The present concept is to extirpate as widely as possible in order to insure complete removal of the malignant process. Since there is no clear line of demarcation between benign and malignant tissue, many patients are subjected to ultraradical surgery, some unnecessarily. On the other hand, a conservative attitude may deprive the patient of any chance of survival.

In spite of extensive research there still remain only two known treatments which have any claims as cancer cures, namely, surgery and radiotherapy. Many methods for treating the disease symptomatically produce temporary subjective results, but no present-day research drug can cure cancer. The extremely controversial and persistent publicity devoted to Krebiozen illustrates the difficulties which beset the practitioner who wishes to treat the stricken patient with the latest drug.

Radical surgery has become an accepted method for salvaging the patient with advanced cancer. Surgery is being relied upon more and more as the preferred modality of therapy, yet how far can it go? I agree with Crile (19), who believes that to "do something" is the course of least resistance. The question is whether that something does more harm than good. Useless operations on the appendix and uterus are not tolerated in hospitals, whereas a useless operation for cancer is accepted. Perhaps in some cases we may be shortening life by prolonging the morbidity.

Guiss (20), a contemporary of mine at Memorial Hospital, has written an exhaustive article on mass roentgenographic screening as a control measure in lung cancer. He concludes that at present the only way to cure lung cancer is to operate while it is in the silent or preclinical stage.

A terminal patient I saw recently had severe pain and was moderately disfigured following treatment with surgery and x-ray therapy. I could not help but feel that the fatal progress of the disease without treatment would have caused fewer symptoms. Under these circumstances the therapist must accept the responsibility for not only the attempts at cure, but also for the associated morbidity.

The chemotherapeutic drugs and antibiotics, although helpful for the relief of the symptoms, must still be placed under the heading of research. Why should this type of research be so expensive to a patient who has already paid dearly for definite treatment that has failed?

Public education

The present-day fear regarding cancer poses the question: Have we failed in our efforts to teach the public? Recently I lectured the members of a women's club where the attendance was half of the expected number because the other half was afraid to hear about cancer.

In the case of the patient, his apprehension is obvious and unlike the fear of any other disease. His morbid attitude creates a problem not only for himself but also for his circle of associates. Should the patient be told? In my opinion, only a small percentage are able to stand the shock of the knowledge that they have cancer. Most patients accept the suspicion that cancer is present, but look to the doctor to repeat his hopeful predictions.

A physician who was a personal friend, used to admonish me for not sitting down with patients and quietly informing them that they had cancer. He felt this way until the disease developed in his wife. From that time on, he would meet me at the door when I came to give treatment, to make sure I would not divulge the nature of her disease.

Cancer publicity, unfortunately, is directed to the public mainly through the newspapers and magazines. In order to simplify the technical language, much of the true significance is usually lost, and the real intent of the speaker often is obscured.

Too often a reporter has a deadline to meet and cannot spend time to verify the true meaning of the speaker. On the other hand, much of this information comes under the heading of "feature articles"—a department in which time is not supremely important. Only if such a story becomes a "newsbreak" is the deadline a factor. In that case, a follow-up story should appear in the next edition, to elaborate the details.

Some of the blame for the unfortunate state of cancer publicity must go to the numerous workers who publish their reports prematurely. When a newspaper gives haphazard treatment to a premature report, it is no wonder the public reacts unreasonably.

Newspaper reports may not only expand the author's ideas but print certain clauses out of context, thus creating a distortion of the true intent. Within the past few months I have read extreme newspaper reports about recent theories of cancer. These varied from incriminating the Los Angeles smog to quoting a statement made at a meeting of the American Cancer Society that most everyone has had cancer but some have been protected by an unknown form of immunity.

Social significance

The effect of cancer on the patient's family has already been mentioned. As a social phenomenon in a more general sense, cancer is a problem to the welfare of a community. This problem cannot be solved satisfactorily unless the disease is treated more effectively or the prognosis better understood. One speaker at a recent meeting had similar thoughts when he claimed that much of the money

donated for this disease is used for research which will benefit the patient who has cancer ten years from now, but practically no expenditures are made for the patient who has cancer today.

A recent news item quoted a well known research doctor as saying that the conquest of cancer would occur in seventy-five years. Such a prediction, unfortunately, provides no solace for this generation.

Research

At the present time, because of the complexity of cancer, researchers are faced with the task of attempting to bring order out of a chaotic situation in which, *a*) the most optimistic results of treatment are cautiously reported as survivals, not cures; *b*) the successful methods of therapy are basically palliative because new methods for curative therapy are sadly lacking, and *c*) the etiology of cancer is unknown.

Whether the basic facts concerning cancer require solution before the investigator can proceed with the task of finding a cure, or whether an empirical program should be tried, is dependent upon the concept of the research worker. The spectrum of investigation varies from that of the worker who evaluates the clinical effect of a caustic to that of the worker with expensive modern equipment who evaluates the constituents of tobacco. Neither type of investigator has, in recent years, given us any additional hope that a cure is near.

Cancer represents abnormal cellular life, but since normal cellular life is only vaguely understood, it would seem necessary to study such basic matters if we are to solve the cancer problem. On the other hand, some of the empirically tested drugs have advanced our knowledge of treatment, though none has increased the rate of cure.

Is there one cause, or many? Obviously a complex disease such as cancer presents innumerable difficulties in finding the answer to this question. To date, large sums of money have been spent on basic research in the hope that a solution, to the riddle of cancer will provide the main clue to its cure. On this basis, it must be agreed that the expense is justified.

Evaluation of therapeutic end-results

The goal of treatment should be permanent cure rather than partial or symptomatic results for a limited period. In certain treated cancer populations the survival rates are much less impressive when the patients are followed for a ten-year period. The morbidity, prolonged hospitalization and deformity in such cases must also be considered. The dysfunction of a jaw following resection of the mandible, the discomfort associated with a permanent colostomy, and the psychologic problems of a mastectomized female are matters of major concern.

At best, most of our treatment is symptomatic. Following partial glossectomy for a malignant ulcer of the tongue, the potential still exists for involvement of the same type of tissue. A mastectomy may eliminate the cancer in one breast, but mammary tissue remains in the other breast exposed to the unknown etiologic factor; thus the concept of performing an ipsolateral radical mastectomy

for cancer in continuity with a contralateral simple mastectomy appears justified.

A study of end-results of therapy in cases of multiple primary cancer has established that the person who once has had a cancer is more liable to have a second cancer than is a person in the general population.

The National Health Education Committee (21) has compiled its Facts on Cancer for 1959. Cancer is the Number Two killer of our people. The Committee estimates that 26 million people now alive will die of cancer unless new treatments, cures or preventive measures are found.

SUMMARY

Cancer is the major medical problem of our time because it affects the social, economic and psychologic life of so many people.

The complex and varied nature of cancer has been outlined in brief fashion. Its significance in relation to medico-legality, treatment, public education, social welfare, research and therapeutic end-results has been discussed.

CONCLUSIONS

The complexity of cancer is a serious challenge. It cannot be simplified. Unless we as a medical profession face this fact, we shall find our position more and more embarrassing under scrutiny.

A final solution to the cancer problem will result from more knowledge of the fundamental facts of cancer, particularly the etiology. The gathering of this knowledge should proceed in a more direct and controlled manner. This could be accomplished by the establishment of a specialty advisory and consultation group composed of medical men who devote their entire time to this disease. Such a group could provide a maximum chance of answering the increasingly crucial questions that arise from the complex nature of cancer.

REFERENCES

1. Ewing, J.: Neoplastic Diseases, ed. 4. Philadelphia, W. B. Saunders Co., 1940.
2. Ewing, J.: Lectures on Tumor Pathology. Published by Cornell University Medical School Class of 1934.
3. MacKinlay, C. J.: Male cells in granulosa cell tumors, *J. Obst. & Gynaec. Brit. Emp.* **64:** 512–522 (Aug.) 1957.
4. Marshall, S. F.: Islet cell tumors of the pancreas producing hypoglycemia, *Surg. Clin. N. America* **38:** 775–784 (June) 1958.
5. Green, R. C., Jr.; Baggenstoss, A. H., and Sprague, R. G.: Diabetes mellitus in association with primary carcinoma of the pancreas, *Diabetes* **7:** 308–311 (July–Aug.) 1958.
6. Butler, F. S., and Harrigan, W. F.: Ameloblastoma, *Am. J. Surg.* **88:** 835–842 (Dec.) 1954.
7. Warren, S., and Meissner, W. A.: Tumors of the Thyroid Gland. Washington, D. C., Armed Forces Institute of Pathology, 1953.
8. Morton, J. J.: Giant-cell tumor of bone, *Cancer* **9:** 1012–1026 (Sept.–Oct.) 1956.
9. Beahrs, O. H.; Woolner, L. B.; Kirklin, J. W., and Devine, K. D.: Carcinomatous transformation of mixed tumors of the parotid gland, *A. M. A. Arch. Surg.* **75:** 605–614 (Oct.) 1957.
10. Bluefarb, S. M.: 'Precancerous' dermatoses, *Geriatrics* **11:** 393–396 (Sept.) 1956.

11. Ackerman, L. V., and del Regato, J. A.: Cancer, ed. 2. St. Louis, C. V. Mosby Co., 1954.
12. Pack, G. T.: Moles and melanomas, *New York State J. Med.* **59:** 2602–2605 (July 1) 1959.
13. Bringardner, A. M., and Horava, A.: The multicentric origin of carcinoma in situ of the cervix, *Am. J. Obst. & Gynec.* **75:** 1302–1304 (June) 1958.
14. Porretta, C. A.; Dahlin, D. C., and Janes, J. M.: Sarcoma in Paget's disease of bone, *J. Bone & Joint Surg.* **39-A:** 1314–1329 (Dec.) 1957.
15. Coley, B. L., and Sharp, G. S.: Paget's disease, *Arch. Surg.* **23:** 918–936 (Dec.) 1931.
16. Paquin, A. J. Jr., and Roland, S. I.: Secondary carcinoma of the penis, *Cancer* **9:** 626–632 (May–June) 1956.
17. Moertel, C. S., and Foss, E. L.: Multicentric carcinomas of the oral cavity, *Surg., Gynec. & Obst.* **106:** 652–654 (June) 1958.
18. Pack, G. T., and Ariel, I.: Tumors of the Soft Somatic Tissue. New York, Hoeber-Harper, 1950.
19. Crile, G., Jr.: Do ultraradical operations for cancer do more harm than good? *Surg., Gynec. & Obst.* **100:** 755 (June) 1955.
20. Guiss, L. W.: Mass roentgenographic screening as a lung cancer control measure, *Cancer* **8:** 219–236 (Mar.–Apr.) 1955.
21. Facts on Cancer, 1959. National Health Education Committee, Washington, D.C., 1960

PSYCHIATRIC DISORDERS OF THE AGED: SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT*

ALVIN I. GOLDFARB, M.D.†

New York, N.Y.

The psychiatric problems of older persons in our society cannot be separated from problems of general medical care or from their social and economic context. At present, the recognition and treatment of psychologic and emotional disorders in the aged is chiefly the responsibility of those in general or specialty practice, rather than of the psychiatrist. Even when aged persons are presented directly to the psychiatrist, as they may be when their disorder provokes social disturbance and emergency admission to a mental hospital, general medical care is usually a necessary part of their treatment.

This is so because the most common psychiatric disorders of the aged that we are called upon to deal with appear to be related to, or interwoven with physical illness, or they are concomitants of the loss of physical and mental efficiency which we tend to regard as natural after three score and ten years of a life span which has been relatively free from serious disease or accident.

The diagnosis and treatment of psychiatric disorders which accompany physical disease or the natural decline which occurs with aging, are usually the problems of the physician who is not a psychiatrist, because he has the first opportunity to become aware of the patient's disorder, to evaluate it, and to treat or refer the patient elsewhere for care.

Many of these patients should remain under the care of the family physician for all of the medical attention they require, including the psychiatric aspects. For some of them, a psychiatrist may be a useful consultant from time to time. However, there are not now and there probably will not be for a long time, if ever, enough psychiatrists to see all of the aged persons who need psychiatric understanding and psychotherapy. These technics must become part of the armamentarium of every physician.

By aged persons, I mean those who are 65 or older. I draw this arbitary age line, as many others do, because at this time of life the characteristics that we associate with age begin statistically to increase sharply in prevalence. These characteristics include the superficial and easily noted symbols such as wrinkles, gray hair, bent frame, slower and less springy step, a decrease of physical exuberance, and decrements in sensory acuity.

A considerable number of persons over 65 years of age have some form of long-

* Presented at the 16th Annual Meeting of The American Geriatrics Society, Atlantic City, N. J., June 4 and 5, 1959.

† Chief, Department of Psychiatry and Neurology, Home for Aged and Infirm Hebrews of New York; Consultant on Services for the Aged, New York State Department of Mental Hygiene, 80-45 Winchester Boulevard, Queen's Village 27, New York.

term illness; in certain cases this includes brain damage. By far the greater number have a small or inadequate income. Nearly all have suffered losses, by death or otherwise, of persons important to them. In almost all who suffer such misfortune, psychologic and emotional reactions arise and are revealed or accentuated. Practically all persons who have lost physical, economic, social and psychologic resources can benefit from psychiatric understanding when it is made available together with other necessary practical or medical assistance.

A large number of these aged persons have reactions which require not only general medical and other types of care, but also the skilled attention of the specialist.

Obviously, all physicians who deal with aged persons should be able to recognize emotional over-reaction to a physical disorder and to differentiate between the somatic symptoms of a purely emotional disorder and the emotional over-reactions to physical illness or a decline of physiologic functions. They should also be able to recognize the consequences or the correlates of brain damage.

All of us who treat aged persons should be able to call upon psychiatric understanding in order to deal with the many psychologic and emotional disturbances which tend to occur along with the physical illnesses and with the socio-economic changes that occur in the later years. Psychiatric understanding should be available not only regarding the problems of the aged patient himself but also with respect to his family and the community in which he lives.

What I am saying is not at all new. In the recent past, even in the absence of complete theory, the way to treat the older person was well outlined by Byrne in 1917 (1). Later, Wayne (2), Allen and Clow (3) and others wrote informatively on the treatment of older persons with emotional disorders. Ginsburg (4) in 1953 presented an excellent paper in which he outlined group-care for older persons on ward services, in homes, in nursing homes, and in mental hospitals.

In this discussion, I do not intend to talk about the necessity of treating a patient as a whole within a socio-economic context, or to emphasize that aged patients have families whose needs must be taken into consideration. I shall deal instead with some difficulties concerning older persons as problems in individual diagnosis and treatment.

RELATIONSHIP BETWEEN PHYSICAL AND MENTAL DISORDER

It should be emphasized that when the aged person with a behavior disorder is brought to the physician, the behavior disorder is often associated with, or complicated by, a physical functional disturbance. Within a home for the aged, for example, referrals to the psychiatrist almost invariably include patients with somatic complaints.

The importance of physical status is underlined by recent studies. In a New York State Department of Mental Hygiene survey (5) the direct examination of a random sample of over 1,000 aged persons more than 65 years old, from old age homes, nursing homes and state hospitals revealed that physical and mental states are closely correlated. The psychiatric and medical examinations also showed that sick aged persons in old age homes or nursing homes need varying but considerable

amounts of psychiatric understanding and care, and that aged persons in state hospitals need surprisingly large amounts of nonpsychiatric medical care.

The findings were especially clear in their revelation that physical functional disability and impaired mental functioning are closely related. It was also noted in persons 65 years of age and more, that poor mental functional status is more commonly found in association with poor physical functional status than with advanced chronologic age. Systemic disease is often related to, and may be an important cause of, brain damage.

Brain damage appears to be the basis for the emergence of a high proportion of disordered behavior in the aged. This is emphasized by state hospital statistics. Among persons 65 years of age and older, upon first admission to New York state mental hospitals, over 90 per cent are classified as having disorders due to so-called senile brain changes or cerebral arteriosclerosis. Both of these conditions appear to be closely related to the general physical condition.

Since less than 10 per cent of such persons admitted for the first time to public mental hospitals have disorders unrelated directly to their physical state, it is not surprising to find that the aged mental-hospital patient needs considerable nonpsychiatric medical care in addition to the psychiatric care for which his admission was arranged. These findings are probably of importance in the planning of mental hospitals. Psychiatric hospitals need large medical departments to provide all the care which new geriatric patients need.

Of all persons eligible for mental hospital care, not all are chosen to receive it. This seems especially true for persons with brain damage who have no chronic marked disturbance of habits or mood; yet in these people mental functional status is impaired, and they may be expected episodically to pose serious problems. At present, a great many such persons are probably under your care in private practice and institutions. The New York State survey of nonpsychiatric institutions and psychiatric hospitals in a metropolitan area disclosed that 80 per cent of aged persons in old-age homes and 77 per cent of those in nursing homes have chronic brain syndrome, as compared to 93 per cent of those in state hospitals at the time of the first admission. Only 15 and 30 per cent in old-age homes and nursing homes, respectively, suffer with severe chronic brain syndrome, as compared to 54 per cent in state hospitals.

DETECTION OF BRAIN DAMAGE

For purposes of treatment and care it is often important to be able to assess the severity of chronic brain syndrome. Behavior disorders with little or no brain damage and behavior disorders with considerable or severe brain damage differ in their course and in their needs for care. Behavior disorders with no evidence, or very little, of chronic brain syndrome are usually related to excesses of fear and anger manifested as depressive states, often with paranoid coloring or as angry paranoid syndromes. A fairly high percentage of these patients are benefited by special individual treatment with psychiatric technics. Another group consists of those in whom disturbed behavior develops along with systemic disease; many of these disturbances are delirious states which subside when the physical illness is

treated. It is a common error to neglect a large group of aged persons who have depression, but in whom the prognosis is good; their disorder is often mistaken for senile brain changes or cerebral arteriosclerosis.

Each physician learns to make his diagnoses in his own way, but we tend to agree that the important factors to determine in this older age group are: First, what role does acute illness, malnutrition, dehydration or drug intoxication play in the development of the symptoms and signs? Second, is the disorder a disturbance of mood, *i.e.*, predominantly an affective disorder, or predominantly a disturbance of thinking and fantasy? Third, is the disorder chiefly one of orientation and memory, which is directly related (not necessarily quantitatively) to brain damage? Fourth, when chronic brain syndrome is present, to what is it related and what is the degree of severity? Fifth, is there a need for hospital protective care?

In order to deal with the first factor—acute illness—all aged persons with behavior disorders should have a complete medical examination. All who have a delirious reaction and are in an agitated state or who manifest rapidly developing confusion should have a sufficiently complete medical study to rule out such factors as pain, infection, metabolic disturbance, dehydration and malnutrition. These cases have the best prognosis. I can assure you that bromide deliriums, for example, still occur. I saw such a woman a few weeks ago. She had received a bromide mixture for insomnia and indigestion—symptoms which in her case were due to depression. When the bromides were stopped her disorientation and confused thinking cleared, revealing her depression and anxiety which could then be successfully treated by combined psychotherapy and drugs.

The second item to consider is the differential diagnosis of the more purely affective or thought disorders and disorders related to brain damage. Impaired mental functioning such as occurs frequently in older persons, has for a long time mainly been classified as either senile deterioration or cerebral arteriosclerosis. These etiologic diagnoses are sometimes misleading. There is need of much more neuropathologic study of cases which have been adequately observed ante mortem, in order to arrive at proper etiologic diagnostic concepts in this age group. Consequently, the newer, more descriptive and more noncommittal term, chronic brain syndrome, is preferable. This diagnosis is advocated by the American Psychiatric Association (6), and it can be qualified by a term suggesting the probable etiology. By chronic brain syndrome is meant impairment of intellectual functioning, defective memory, disturbance of orientation for time, place or person, and decreased grasp and lack of adequate comprehension of situations and events such as is commonly a sign of brain damage. Obviously, in evaluating the patient's functioning, the physician must be mindful of the background and environment. Defects in intellectual functioning of a school teacher may not be revealed by the tests one uses for a patient who has had little or no education and whose lifelong occupation has been unskilled labor. Orientation for time must also be evaluated in terms of the person's background and habits. The patient with a lifelong habit of reading a daily newspaper and of dating and signing notes each day cannot be indiscriminately compared to persons who neither read nor write

and who live in a social climate devoid of calendars, daily papers, and interest in chronology except for feast and fasting. Brain damage may be more readily manifested by a disturbance of orientation in persons whose early opportunities have been limited, whose habits of self-maintenance are poor, and whose present opportunities to develop compensatory technics are also limited. Apparently a behavior disorder is far more likely to arise in association with chronic brain syndrome in persons whose early socio-economic state was one of deprivation and was followed by a lifelong underprivileged state in which character, health, and some habits were stunted and spoiled. This possibility is being studied at present. The prophylactic implications are enormous.

Thus, although brain damage may be necessary for the development of chronic brain syndrome, it is not sufficient alone to give rise to obvious manifestations of cerebral incompetence. Members of an audience such as this may possibly be lucky; the background of education, occupation and opportunities makes it unlikely that the type of disorientation, memory defect and impairment of judgment which goes by the name of chronic brain syndrome and tends so frequently to require institutional care, will overtake us.

Chronic brain syndrome—the disturbance of memory, judgment and orientation—is the clinical psychiatric evidence of brain damage. Robinson (7) and Pampiglione and Post (8) in England demonstrated that these signs tend to parallel the electroencephalographic evidence of brain damage in such a way that from the severity of the clinical signs one can predict the severity of the electroencephalographic signs, and vice versa.

TESTS FOR CHRONIC BRAIN SYNDROME

How can the presence and severity of chronic brain syndrome be evaluated? Hopkins and Roth (9), a number of years ago, showed that chronic brain syndrome can be reliably detected by a brief questionnaire. We have worked on this question to a considerable extent recently (5) and have found that a simple method for determining the presence of chronic brain syndrome is to include 10 tactfully applied questions within the framework of the history taking and examination.[1] It is better to use the same set of questions for all patients (though it may be varied to suit the circumstances) rather than have the burden of devising a new and special set for each person. Using the same set of questions repeatedly gives one a standard by which all can be measured.

The following 10 questions were asked of more than 1,000 persons: 1) Where are you now? 2) What is this place? 3) What day is this? 4) What month is it? 5) What year is it? 6) How old are you? 7) What is your birthday? 8) What year were you born? 9) Who is the President of the United States, and 10) Who was the President before him?

It is desirable to cover more than these questions in a final determination of the mental status, but if at least these 10 are tactfully worked into the history

[1] This test was devised and developed by Robert L. Kahn, Ph.D. and Max Pollack, Ph.D., senior psychologists in the Office of the Consultant on Services for the Aged, New York State Department of Mental Hygiene.

taking and the replies evaluated, one can secure fairly reliable first impressions. These questions cover such important items as the patient's orientation for time, place and person; his intellectual functioning as indicated by the amount and availability of his general information; and his ability to note and correct discrepancies, if any, between his present age, the present date as given, and his birth date as he has given it in response to the questions.

When a patient makes an error (*e.g.*, about the date), the examiner can reassuringly supply the correct information and then ask the same questions later as a test for another item, the patient's recent memory. If a relative can provide accurate data about the birth date, this provides a check for evaluation of the patient's more remote memory.

One should not make a final diagnosis on the basis of a rapid and cursory appraisal, and even the most complete assessment of mental status needs to be checked by objective methods of examination. In this connection Bender's face-hand test is useful. This consists of double simultaneous stimulation of the cheek and hand of the patient, who reports where he has been touched. Bender, Fink and Green (10, 11) found that in patients known to have organic brain disease the results of the test were almost invariably positive, and in most patients with non-organic mental disorder the results were negative. The test is performed in the following manner: The patient sits opposite the examiner with his hand resting on his knees and his eyes closed. The examiner touches the patient simultaneously on the cheek and the dorsum of the hand, contralaterally and ipsilaterally in a specific order so as to include at least ten trials. Asymmetric stimuli to the face and the dorsum of the hand are alternated with symmetric stimuli, *e.g.*, stroke the right cheek and the left hand; the left cheek and the right hand; the left cheek and the left hand; the right cheek and the right hand; and both cheeks, both hands. Each of these sets of stimuli is used twice, in mixed order. The patient reports, as accurately as he can, where he has been touched. Some astonishing results are obtained with older people when this test is performed with the patient's eyes closed; the results are even more surprising with the eyes open. The patient with whom you have had an interesting general conversation and whom you may regard as getting along relatively well or having only a mild disturbance, may do odd things with this test. The stimulation of the cheek will be reported, whereas the stimulation of the hand will be ignored. When the questioning is pressed, making clear that the touch has been in two places, the patient may say, "Well, you touched me here and here," pointing to the cheek correctly but also to a place perhaps entirely apart from his own body, or to a part of the examiner's body, or to a part of his own body that was not touched.

If the results of the test are positive with the patient's eyes closed, the test is repeated with the eyes open. It is fairly certain that positive results with eyes closed indicate brain damage. It is practically certain that positive results with eyes open indicate brain damage and chronic brain syndrome. Interestingly, the test findings are negative with the eyes open in a very small percentage of persons in whom they are positive with the eyes closed.

SEVERITY OF CHRONIC BRAIN SYNDROME

Orientation: In order to grade the severity of the patient's chronic brain syndrome, the degree of orientation must first be appraised. In general, I follow these rules: Disorientation is *mild* or nil when persons in the family or friends are recognized and can be named by the patient, when places are correctly named and located in answer to the question "Where are you now?", and when the date is correctly given with respect to the year, the month and the approximate day of the month. I sometimes even allow the year 1958 as correct for 1959, but would regard 1960 as wrong. A good deal depends upon how you ask these questions. Disorientation is *moderate* when persons are almost always correctly identified by the patient, but places are only approximately identified or located, and time is not correctly given for the year, month, and the day of the month. Disorientation is *severe* when persons are misidentified, places are also incorrectly named and located, and the year and time of the month not given correctly. When disorientation is severe, chronic brain syndrome usually can also be considered as severe.

Intellectual impairment: For rapid screening of patients as to the degree of mental functional impairment, an assay of orientation alone may be used. For example, if you are invited to survey a home for the aged and want to ask a few questions of the 90 or 100 residents as you go through, you could ask: "Where are you now?", "What is this place?", "Who am I?", or "Who is that?" (pointing to the nurse or attendant who should be known to the patient), "What is my (her) name?". When aged patients are brought to your office with complaints suggestive of chronic brain syndrome, an excellent test of orientation is to ask, tactfully, as though introducing oneself, "Do you know who I am?", "What is my name?". If there is hesitancy and inability to name you—and it is surprising how often this occurs with older people—you can be fairly sure that the patient has chronic brain syndrome.

Severity: In grading the severity of chronic brain syndrome, the following rules are useful: Chronic brain syndrome is *mild* when defects of general information are present but memory and orientation are relatively good. It is *moderate* when intellectual powers (general information), calculation and memory are impaired, but orientation is fair or good. It is *severe* when there are obvious defects of orientation as well as of memory and intellectual function. These are only clinical impressions which need confirmation by further observations.

All of these diagnostic items are mentioned because a careful evaluation of mental status in aged persons invariably reveals that when one defect of mental functioning is present others can usually be found. Unless there is impairment in intellectual functioning *and* memory *and* orientation, the diagnosis of chronic brain syndrome is not justified, even although the disorder present appears to be influenced in some degree by a disturbance in cerebral functioning either because of loss of brain tissue or non-support of its function. Even when disorientation is mild, one finds some impairment of memory and intellectual functioning if the condition is true chronic brain syndrome.

DEPRESSIVE REACTIONS

What about the symptoms and signs of depression? Some of the symptoms of depression are constipation, loss of appetite, loss of weight, lack of energy, lack of interest, and poor concentration. We should not be deluded into thinking that constipation is normal for the aged. Steinhardt *et al.* (12) have documented this in a study at the Home for Aged and Infirm Hebrews of New York. When aged persons are constipated, there is a reason, just as in younger persons; often the reason is chronic mental depression.

Radio programs previously enjoyed generally cannot be followed by persons who feel depressed. Television programs once absorbing to them now do not hold their interest. Feelings of sadness, especially in the morning, are common.

Severe sleep disturbance, usually after falling asleep with little difficulty, is a symptom of depression. Practically pathognomonic is waking in the early morning hours, with tossing and restlessness, rumination about problems and feelings of anxiety or sadness. There may be waking, an interval of rumination, falling asleep again, and re-awakening. Often the rumination of the elderly person is "empty"; "I just lie there and wish I were well, that this was all over"; or, "I think of how awful this is"; or, "I just think of my sickness."

Self-deprecatory ideas, ideas of sin and guilt, are common in younger persons but are not frequently seen in the aged. In fact, instead of guilt there is more often an open display of resentment and anger. It may be acted out by awakening the marriage partner during the night, by noisy wandering about, or by multiple punitive complaints. A common characteristic of depression in the elderly is the insistence by the person upon the absence of cause for such "low" feelings. There may even be an insistence that sadness is absent, although frequent crying spells or a desire to cry may be confessed immediately upon questioning about this. There are frequently expressed feelings of worthlessness.

Sometimes the depression is not apparent to the observer and appears under the mask of somatic complaints or complaints about personal appearance and plaintive repetitions of having "nothing to wear" except clothes that are a bad fit. Not infrequently the depressed man asks his wife, "What tie shall I wear? Do you think this one goes with this suit?" Such evidence of irritation with one's self and one's possessions are the clues to a depression. Often these irritations with self are placed in the past—failure to have made a sensible purchase, or brooding about the missed minor social opportunity of months ago.

Loneliness is a symptom of depression, not a cause. It is a frequent plaintive complaint of the depressed aged person. Feelings of monotony, futility and hopelessness, repetitive complaining about other persons, indifference, and even hostility are more often than not evidences of depression. The complaint is a clue to the person's longing for a helpful supportive person or persons.

IMPLICATIONS FOR TREATMENT

In dealing with aged patients, even when they are extremely depressed, one should remain acutely aware that their somatic complaints may indicate the

existence of previously unnoted diabetes, hypertension or glaucoma. These disorders may be aggravated by a depression, and their subclinical forms may become full-blown during a change in mood. Exacerbation of these disorders often may be ameliorated when the accompanying depression is recognized and treated, whether it be by drugs, electroshock or psychotherapy.

Conversely, all old persons with diabetes, hypertension or glaucoma should be appraised for disturbances of mood. A depression, with or without paranoid coloring, may be the introductory phase of chronic brain syndrome. Too often the somatic aspect of a disease is treated but the psychologic aspect is neglected.

It is pertinent to mention an angle of hypochondriasis which is commonly seen in aged patients. The depressed parent-patient is brought to the physician, claiming good or passable health, but the family complains that she is overly concerned about her child or her grandchild, whose diet, bowel movements and general health are her constant pre-occupation. One should be aware of this form of "hypochrondriasis," projected onto the child and used as a means of maintaining the relationship and attempting to perpetuate a dominating role.

CONCLUSION

It is important to differentiate between the various types of behavioral disorders in older persons, despite their age and seeming short life expectancy. Some of them have clear-cut chronic brain syndrome which can be diagnosed quickly and easily by the brief questionnaire described here, which includes tests for time, place, person, memory and intellectual powers. Evidences of depression and of paranoid states can also be readily elicited, and careful study will enhance the possibilities of identification and successful treatment. By thorough examination, systemic disease which might otherwise escape notice can be detected; appropriate treatment may decrease the behavioral disorder.

The proper diagnosis of disordered behavior in an aged person may convert a seemingly insoluble problem into one at least partly remediable, to the delight of the patient, his family and the physician.

REFERENCES

1. Byrne, J.: Psychotherapy of old age and chronic invalidism, *Hospital Bull.* (New York City Dept. of Charities) **1:** 103, 1917.
2. Wayne, G. J.: Psychotherapy in senescence, *Ann. West. Med. & Surg.* **6:** 88, 1952.
3. Allen, E. B., and Clow, H. E.: The psychiatrist's role in the care of the aging, *Geriatrics* **7:** 117, 1952.
4. Ginsberg, R.: Geriatric ward psychiatry; techniques in the psychological management of elderly psychotics, *Am. J. Psychiat.* **110:** 296, 1953.
5. Goldfarb, A. I.: Summarization of Activities for the Year 1958, from the Office of the Consultant on Services for the Aged. Report to the Commissioner of New York State Department of Mental Hygiene, Albany, New York, September 1959.
6. Mental Hospital Service, American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders. Washington, D.C., American Psychiatric Association, 1952.
7. Robinson, R. A.: The correlation between E.E.G. abnormality and senile arteriosclerotic organic deterioration, *in* Old Age and the Modern World. Report of the Third Congress (London, 1954), International Association of Gerontology. Edinburgh, E. & S. Livingston, Ltd., 1955, pp. 433–437.

8. Pampiglione, G., and Post, F.: The value of electroencephalographic examination in elderly psychiatric patients with suspected brain lesions, *Ibid.*, pp. 430–433.
9. Hopkins, B., and Roth, M.: Psychological test performances in patients over 60, *J. Mental Sc.* **99:** 146, 1953.
10. Bender, M. B., and Fink, M.: Tactile perceptual tests in the differential diagnosis of psychiatric disorders, *J. Hillside Hosp.* **1:** 21, 1952.
11. Fink, M.; Green, M., and Bender, M. B.: The face-hand test as a diagnostic sign of organic mental syndrome, *Neurology* **2:** 46, 1952.
12. Steinhardt, R. W.; Zeman, F. D.; Tuckman, J., and Lorge, I.: Appraisal of physical and mental health of the elderly: use of Cornell Medical Index and supplementary health questionnaire, *J.A.M.A.* **151:** 378, 1953.

A NEW METHOD OF DERIVING THE VECTORCARDIOGRAM FROM ROUTINE CLINICAL ELECTROCARDIOGRAPHIC LEADS

GEORGE EASTMAN, M.D.*

Department of Internal Medicine, McKeesport Hospital, McKeesport, Pennsylvania

INTRODUCTION

An understanding of the concepts and the terminology of vectorcardiographic technic is necessary for intelligent reading of much of the recent electrocardiographic literature. This is to be expected, since vector analytical methods are probably the best available for recording the electrical events which accompany myocardial contraction (1–11).

An added advantage to an understanding of vectorcardiography is the fact that its theory provides a fairly complete explanation of the genesis of standard electrocardiographic patterns as they appear in both normal and abnormal tracings. Thus the memory is relieved of the burden of remembering a mass of unrelated and basically unclassifiable patterns representing various disease states. Knowledge of the meaning of the vectorcardiogram lends ease and authority to the interpretation of the scalar electrocardiogram.

This field was opened to the current intensive research efforts by the development of the cathode-ray oscilloscope as a recording instrument. It permits instantaneous, inertia-free, integrated biplanar recording of myocardial action currents. These currents are seen on the face of the scope as series of loops, one set for each heart beat, rather than as the P-QRS-T pattern characteristic of the electrocardiogram.

Interpretation of the vectorcardiogram, however, can neither be thoroughly learned nor long remembered without the opportunity for continuing practice as gained by working with many sets of vector tracings. It is necessary to appreciate the range of normal tracings, as well as to learn the deviations which permit a definitive diagnosis of cardiac abnormality. It takes more than the study of a few tracings which appear as text or journal illustrations to keep one's intellectual "tools" properly sharpened.

Physicians fortunate enough to have access to an oscilloscopic vectorcardiograph can accumulate both a mental and a physical file of the loop patterns seen in various clinical situations and thus draw meaningful parallels between the vector tracings and the corresponding scalar electrocardiograms.

In addition, a file of vectorcardiograms is useful in teaching basic electrocardiography to such groups as hospital house staffs or other physicians beginning the study of the field. Properly used, the vector approach is probably one of the most satisfactory methods of explaining the genesis of the patterns of the various scalar leads.

Unfortunately, the vectorcardiograph has not been generally available outside

* *Address*: 102 Olr Claidton Road, Pleasant Hills, Pittsburgh 36, Pa.

the research laboratory or the large teaching hospital. The technical difficulties involved in operating the instrument, the problems inherent in standardization and electrode placement, the conflict between the various geometric coordinate systems advocated, and the photographic problem of recording all of, but no more than, a single vector loop have all militated against widespread acceptance of this highly useful technic.

Moreover, in a hospital electrocardiographic department it would still be necessary to obtain the routine twelve-lead scalar electrocardiogram on each patient because: 1) the scalar electrocardiogram includes time as a parameter and thus cannot be excelled for the analysis of arrythmias, and 2) the referring clinician will wish to have a copy of the electrocardiogram he has become versed in reading, in order to make it part of his patient's record.

It therefore seemed advisable to investigate whether a useful set of vectorcardiographic loops could be derived from the lead tracings as recorded in standard electrocardiographic practice.

HISTORY

It is theoretically possible to derive the vectorcardiogram and the electrocardiogram from each other, since they represent only different methods of recording the same electrical events. The practical problems inherent in achieving this purpose are primarily caused by the fact that each technic has developed the recording methods, electrode placements and planar co-ordinate systems which most benefit itself, with little thought to the possibility of interconversion.

Derivation of the mean frontal plane vector of the QRS complex, but not the entire frontal plane loop, has been carried out for many years in the determination of the mean electrical axis by various modifications of the Einthoven equilateral triangle hypothesis.

The first extensive description of methods for deriving a vectorcardiogram from selected scalar electrocardiographic leads was made by Goldberger (1, 2). He discussed the various coordinate systems in use and showed how it is possible, either by using routine clinical leads or leads specially recorded for the purpose, to derive geometrically the various loop patterns seen on the oscilloscope screen His method, however, requires accurate multiple measurements of the instantaneous value of the QRS deflection a number of times during each cardiac cycle. This is so impractical as to have precluded any widespread acceptance of his method.

A method for deriving various parts of the vector loop from standard clinical electrocardiograms has been advanced by Grant (3). His advocacy of the use of mean values for the initial, total and final vectors of the QRS complex has much to recommend it. His cylindrical reference system using "solid" conically tipped arrows has been adopted by other authors (4). The visualizations of the cardiac electrical action potential are excellent, but the system suffers from the basic lack of transferability of the visual picture into any of the triplanar coordinate systems that are used for oscilloscopically recorded vectorcardiograms. Thus, one cannot cross-apply insights gained from articles and texts using this

technic, to material learned from the more conventional types of vectorcardiography.

Recently a method has been proposed for recording the vector leads of the cube reference system in the form of three additional special "XYZ" leads on the clinical electrocardiograph (5). The principal objection to this technic lies in the necessity to change the electrode placement and recording sensitivity level from that in regular use. Because of this, only those electrocardiograms which, as the result of prior planning, contain the extra leads are subject to analysis by this method. Thus it is not useful for the retrospective study of routine tracings or analysis of electrocardiograms found in the literature.

The method proposed in this article borrows liberally from its predecessors. It is, in essence, a synthesis of parts of several methods, and is aimed at permitting the derivation of clinically valid vector loop patterns from tracings that are part of the conventionally recorded twelve-lead scalar electrocardiogram. It is hoped that such a method will gain the wider utilization that is compatible with its deliberately chosen minimal initial data requirements.

THEORETICAL CONSIDERATIONS

From the material cited in the historical survey, it is apparent that the geometric interconvertibility between the vectorcardiogram and the electrocardiogram has been recognized and used by a number of previous authors. That such interconversion is possible is the result of the fact that the two technics, although differing in instrumentation and the appearance of the tracings, do record the same underlying bioelectrical phenomena.

All the cellular electrical events which occur during myocardial activation can be summed up as the paths taken by a successive set of moving electrical dipoles, each of which possesses the vector qualities of magnitude and direction as well as motion. The pathways traced by these moving dipoles in a three-dimensional matrix produce a series of "solid" loops.

One loop each will be formed for the P wave, the T_a wave, the QRS complex, the T wave and, if present, the U wave. In practical vectorcardiography, as in electrocardiography, the T_a loop is usually obscured by, and becomes a part of the QRS loop which follows it.

The vectorcardiogram, either oscilloscopically recorded or geometrically derived, is in the spatial sense the "first derivative" of these 3 dimensional loops. In the same way as a solid object can cast its shadow on a flat wall, so these loops cast their two-dimensional projections or "shadows" on selected reference planes on which their characteristics can more easily be studied than in their original form. These two-dimensional patterns, which are also loops, are technically known as Lissajoux figures.

In turn, the clinical electrocardiogram is geometrically the "second derivative" of the original three-dimensional spatial loop, and at the same time is the uni-dimensional (linear) projection of the bi-dimensional planar vectorcardiographic loop. Using this concept, the movement of the electrocardiograph stylus represents the movement of the initial point of the developing vector loop, as projected on lines placed at various angles about the thorax. The second dimension of the electrocardiogram is time, rather than another electrical magnitude at some definite angular direction as in the vectorcardiogram.

The limb leads (I, II and III) and the augmented unipolar extremity leads (aV_r, aV_l and aV_f) can be regarded as projections of the frontal plane vector. The chest leads (V_1–V_6) represent in a less exact manner the projections of the horizontal-plane vector loop.

Interestingly enough, although in theory the oscilloscopic vectorcardiogram is one step closer to the existent spatial loop, in actuality it is derived by the electronic "integration" of two selected bipolar electrocardiograph-like leads. Electrodes are applied to two selected sets of two points on the torso, and the action currents from each set are amplified and then simultaneously applied to the horizontal and vertical plates of a cathode-ray oscilloscope. This simultaneous recording of two uni-dimensional electrical events produces the integration described, and thus the vector loop is recorded (6).

In this sense, the vectorcardiogram cannot contain any more information than is already present in the two lead tracings from which it was electronically produced. However, granted adequate instrumentation and judicious selection of lead points and amplification factors, the electronic method is and will remain the standard against which other methods must be judged. It has the advantage of producing a recording that contains a virtual infinity of points for which the synchronism of the coordinate values is instrumentally assured, and which therefore can *a priori* be assumed to follow faithfully all possible types of loop contours.

On the other hand, the derived vectorcardiogram can be made up of only a comparatively small number of points for which the synchronism of the coordinates cannot be totally guaranteed. Therefore its ultimate value must rest on a pragmatic demonstration of its utility and its closeness of resemblance to the electronic vectorcardiogram.

A practical demonstration of the comparability of the loops geometrically derived by this method with those described as representative of the normal and the pathologic vectorcardiogram will be given in a subsequent section. Before this can be undertaken, however, some specific questions of geometric theory must be raised and answered in order to demonstrate the technic's basic validity. These are:

1. What is the maximum number of point determinants which can be derived by inspection from the routine electrocardiographic lead tracing?

2. What is the minimum number of points necessary to produce a valid loop pattern clinically comparable with the electronically recorded vectorcardiogram?

3. Which accepted three-plane reference system can best be adapted to the geometric method? Are there clinical leads which lie parallel to such planes?

4. Are the point coordinate values from which the derived loop is plotted, sufficiently close to being simultaneous in time to permit plotting a loop of clinical usefulness? Can approximations be made which provide working alternatives to the use of multi-channel recording equipment?

In answer:

1. There appear to be 5 determinants which can be readily extracted by inspection from the electrocardiographic recording of a normal QRS deflection. From the routine P and T waves, only 2 determinants each can be derived.

2. The 2 determinants derivable from the P and T waves respectively (deflection direction and mean magnitude of each) are insufficient to determine a loop pattern, but can determine a vector arrow representing the mean vector for each deflection. These arrows have been adopted as part of the present method. On the other hand, the 5 parameters extractable from the QRS complex are sufficient to depict either the ellipse, the partial cardioid shape, or the cardioid shapes seen as QRS vector loops recorded electronically. Under special clinical circumstances these 5 parameters can be supplemented by additional ones to plot selected portions of the loop of greatest practical interest.

3. By fortunate coincidence, the three-plane reference system which is easiest to visualize also has its axes closely parallel to those of 3 mutually perpendicular electrocardiographic leads. The reference system is that of the cube (7), the faces of which are the anatomic body planes—the frontal, the sagittal and the horizontal. The electrocardiograph leads are I, aV_f and V_1.

4. To obtain practical, if not theoretical, equivalence in time of the point coordinate values plotted from two successively recorded electrocardiographic tracings, one can utilize the concept of *mean* values for the initial, the entire, and the terminal portions of

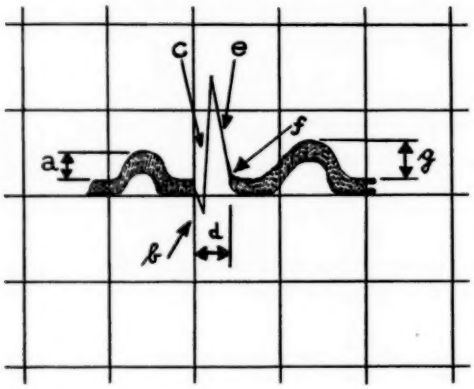


FIG. 1. Parameters:

a. P wave vector = +1.5 mm.
b. QRS initial direction—minus.
c. Mean initial QRS 0.04-second vector, −1+6/2=+2 mm.
d. Mean entire QRS vector, −1+6=+5 mm.
e. Mean terminal QRS 0.04-second vector, 6/2=+3 mm.
f. QRS terminal direction—minus.
g. T-wave vector, +2 mm.
Normal standardization: vertical, 1 mm.=0.1 mv.; horizontal, 1 mm.=0.04 second.

each complex. These values approximate those existent at the ¼, ½, and ¾ points of the deflection, and can be more accurately determined by calculation than the actual points themselves can be approximated by inspection. In addition, the averaging procedure tends to minimize differences of time values between the two tracings that account for any one loop. The concept of using mean initial and terminal values has been previously validated (3), and the concept of mean value for the entire QRS magnitude has long been employed to determine frontal-plane mean axis deviation either by plotting on an Einthoven triangle diagram or by the use of a Dieuaide chart.

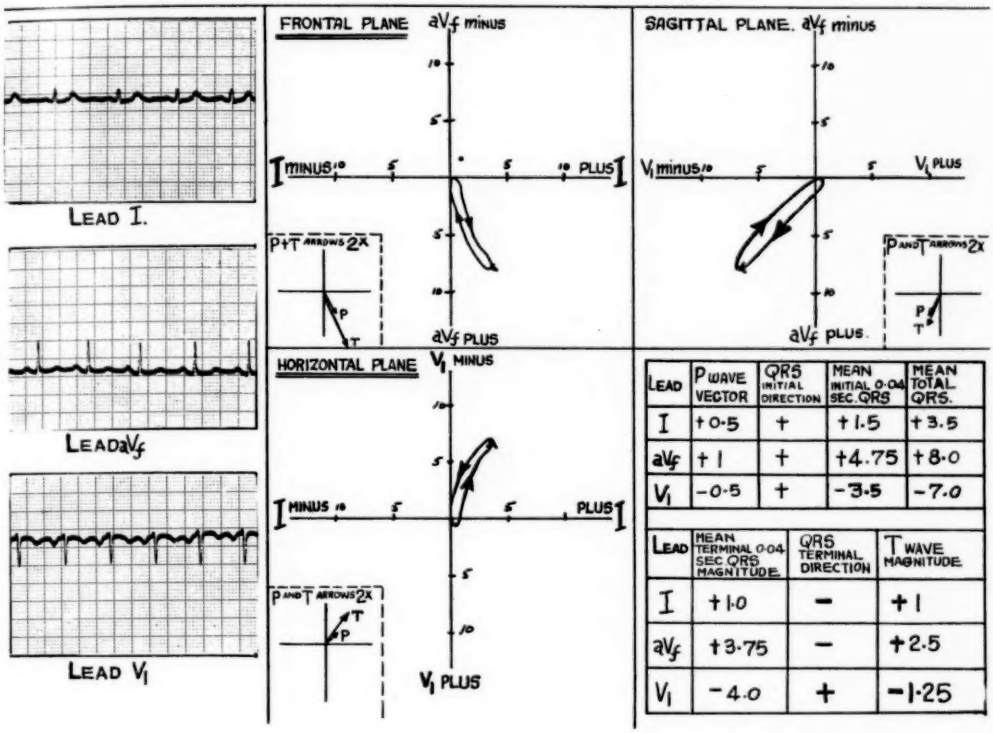
The errors introduced by the conversion from a supposed area measurement (mean values for the partial or entire QRS vector) to a point determinant system, and by the assumption of constant velocity (zero acceleration) of the QRS deflection leading point are recognized; they are accepted as necessary but not serious limitations in order to gain the advantage of temporal "averaging."

METHOD

Parameters

For each set of vectorcardiographic loops, a set of tracings for 3 clinical electrocardiographic leads I, aV_f and V_1 is obtained. By inspection and calculation from each tracing there is usually derived a set of 7 values which are entered in an appropriate table such as that shown in Figure 1 and subsequent illustrations. These parameters are: **a**) P wave vector; **b**) QRS initial direction; **c**) mean initial 0.04-second QRS vector; **d**) mean total QRS vector; **e**) mean terminal 0.04-second QRS vector, **f**) QRS terminal direction, and **g**) T wave vector.

Additionally, in selected instances, it may be desirable to plot a J value for a QRS deflection which does not return to the baseline at the beginning of the S-T segment, and also a mean middle 0.04-second QRS vector when, as in bundle-



LEAD	P WAVE VECTOR	QRS INITIAL DIRECTION	MEAN INITIAL 0.04 SEC. QRS	MEAN TOTAL QRS.
I	+0.5	+	+1.5	+3.5
aVf	+1	+	+4.75	+8.0
V1	-0.5	+	-3.5	-7.0

LEAD	MEAN TERMINAL 0.04 SEC. QRS MAGNITUDE	QRS TERMINAL DIRECTION	T WAVE MAGNITUDE
I	+1.0	-	+1
aVf	+3.75	-	+2.5
V1	-4.0	+	-1.25

FIG. 2. Normal vectorcardiogram

branch block, the QRS duration is greater than 0.12 second. This latter value would then be labelled *e*, and the mean terminal 0.04-second QRS vector which would follow would be labelled *é*. The tabulation may be simplified by using the letter designations of the parameters rather than their entire names. The use of bow compass dividers and a simple convex hand magnifier, as in electrocardiographic analysis, is helpful but not essential.

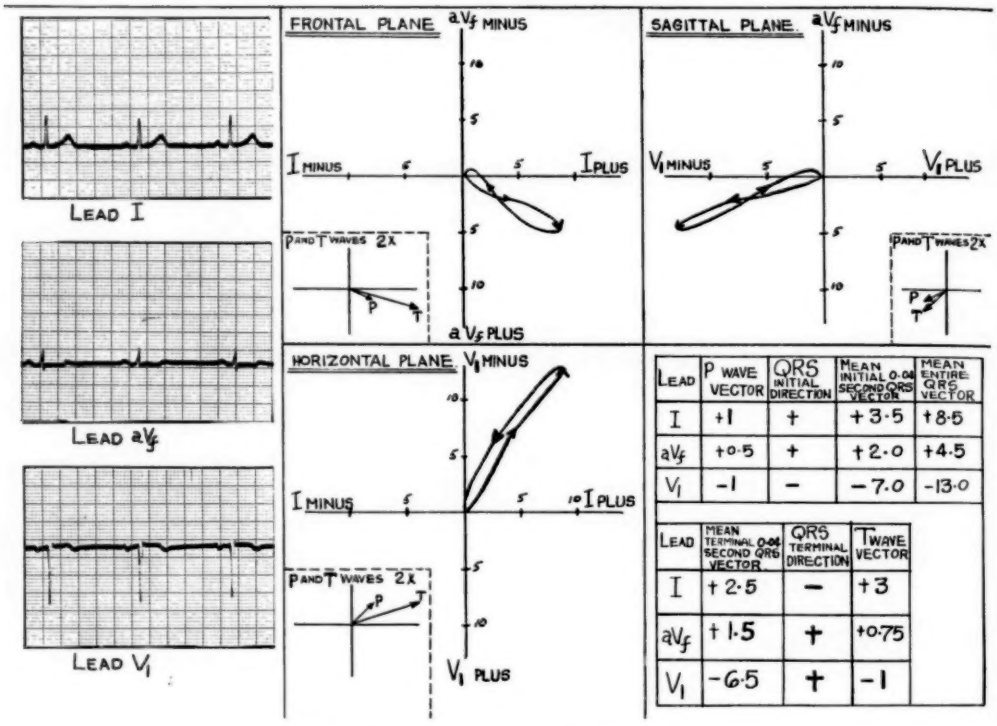
Determination of vector values

The values are determined from each lead in turn as follows (Fig. 1):

a. The mean P wave value is derived by determining the number of millimeters of maximum deflection of the P wave above or below the baseline. Each millimeter represents a potential of 0.1 millivolt by normal electrocardiographic standardization. It is tabulated as either plus or minus in accordance with its position above or below the baseline respectively. In the event that the wave is biphasic, the algebraic sum (taking into accord the plus and minus signs during the addition) is used.

b. The direction in which the initial portion of the QRS deflection leaves the baseline is noted as either positive or negative for movement above and below the baseline respectively.

c. The P-R interval is checked for each of the leads, to prevent an isoelectric initial portion of the QRS complex going unrecognized. A deflection is chosen in



LEAD	P WAVE VECTOR	QRS INITIAL DIRECTION	MEAN INITIAL 0.04 SECOND QRS VECTOR	MEAN ENTIRE QRS VECTOR
I	+1	+	+3.5	+8.5
aVf	+0.5	+	+2.0	+4.5
V1	-1	-	-7.0	-13.0

LEAD	MEAN TERMINAL 0.04 SECOND QRS VECTOR	QRS TERMINAL DIRECTION	T WAVE VECTOR
I	+2.5	-	+3
aVf	+1.5	+	+0.75
V1	-6.5	+	-1

FIG. 3. Normal vectorcardiogram

which the QRS deflection begins on one of the vertical time lines. The type of stylus movement in the space to the next time line (0.04-second interval) is determined. Dependent upon the variety of deflection pattern inscribed, the mean initial 0.04-second vector value is calculated by the following technics:

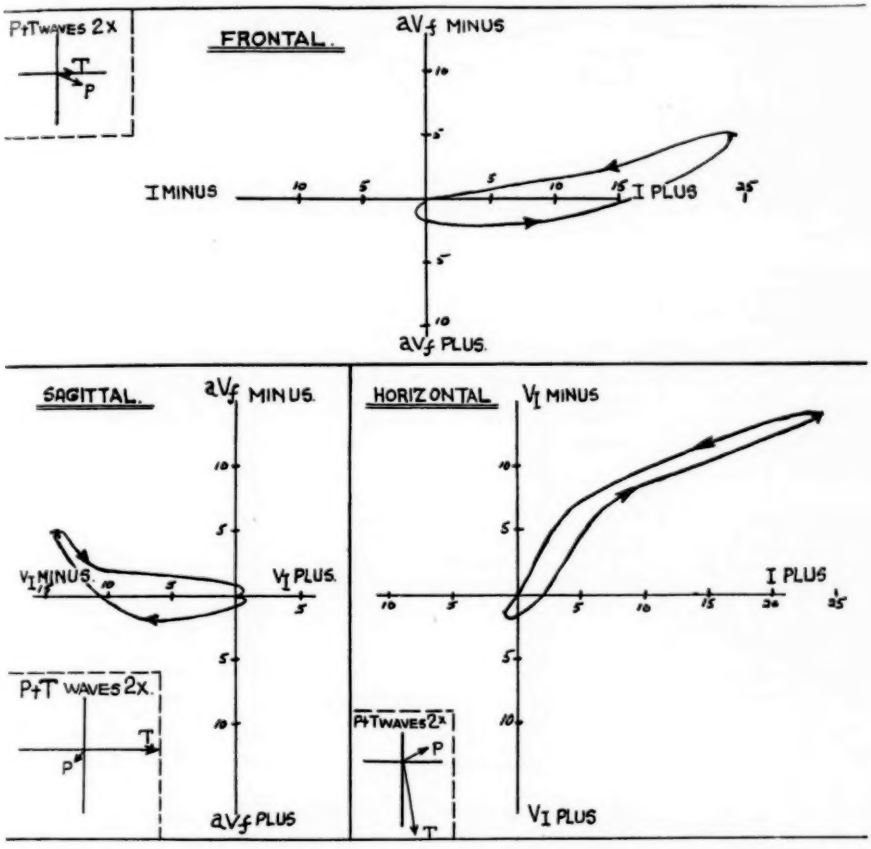
1. If the deflection leaves the baseline and continues in the same direction during the whole time period, the plus or minus numerical value at the end of the interval is divided by 2 and entered in the table as the mean initial vector value.

2. If the deflection leaves the baseline, passes through a maximum or minimum value and does not return to the baseline, then to the maximum or minimum point attained is added the distance which the deflection has traveled in returning to the baseline; this arithmetical (having neither positive nor negative sign) sum is divided by 2 and is given an algebraic sign, either plus or minus, dependent upon whether the end-point of the deflection is above or below the baseline.

3. If the deflection leaves the baseline, passes through a maximum or minimum value, and returns to the baseline at the end of the time interval, the algebraic value of the distance to the maximum or minimum point is entered as the mean initial vector value.

4. If the deflection leaves the baseline, passes through a maximum or minimum value, and returns to and progresses beyond the baseline in the opposite direction, then to the algebraic value of the maximum or minimum point is added half of the algebraic value of the distance attained beyond the baseline in the opposite direction. This becomes the mean initial vector value. The illustrative example in Figure 1 is calculated in this manner.

5. If the deflection leaves the baseline, passes through a maximum or minimum value, returns to and progresses beyond the baseline in the opposite direction, attains another and opposite turning point, but does not return to the baseline a second time, then to the



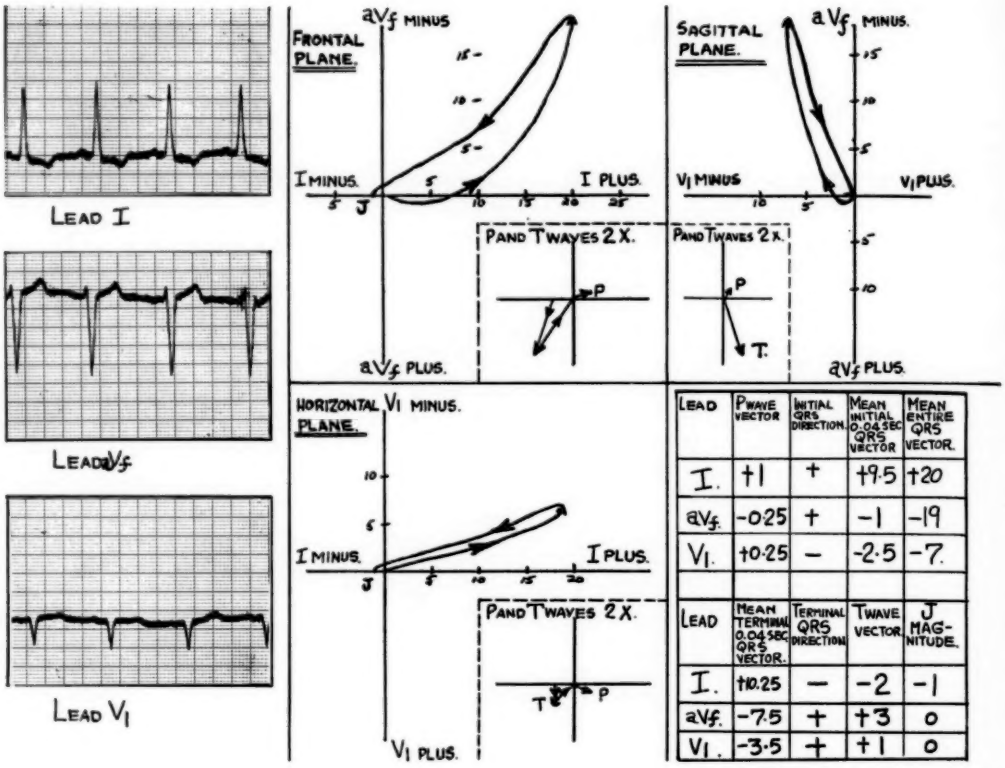
LEAD	P WAVE VECTOR	QRS INITIAL DIRECTION.	MEAN INITIAL 0.04 SEC. QRS VECTOR	MEAN TOTAL QRS VECTOR	MEAN TERMINAL 0.04 SEC. QRS VECTOR	QRS TERMINAL DIRECTION.	T WAVE MAGNITUDE.
I	I	−	6 1/2	24	13	−	1/2
aVf	1/2	+	2	−5	−2	+	0
VI	−1/4	+	−7	−14	−11	+	3

FIG. 4. Left ventricular hypertrophy

algebraic value of the first turning point is added half of the arithmetical sum of the second transition point and the amount of subsequent re-return to the baseline, after the appropriate plus or minus sign has been appended as described in section 2.

6. Should the deflection pass through a series of two transitions and return to the baseline at the end of the time interval, then the mean value is determined by the algebraic sum of the two minimax points.

Analysis of these methods for obtaining the mean 0.04-second vector value shows that in essence they consist of the determination of the total linear travel of the deflection during the chosen time interval and then the determination by calculation of the location of its mid-point. When a deflection is relatively short this can often be accomplished by simple inspection, but the described method assures accuracy of vector calculation even though multiple direction changes occur in tracings of large deflection values.



LEAD	P WAVE VECTOR	INITIAL QRS DIRECTION	MEAN INITIAL 0.04 SEC QRS VECTOR	MEAN ENTIRE QRS VECTOR.
I.	+1	+	+9.5	+20
aVf.	-0.25	+	-1	-19
V1.	+0.25	−	-2.5	-7.

LEAD	MEAN TERMINAL 0.04 SEC QRS VECTOR.	TERMINAL QRS DIRECTION	T WAVE VECTOR	J MAGNITUDE.
I.	+10.25	−	-2	-1
aVf.	-7.5	+	+3	0
V1.	-3.5	+	+1	0

FIG. 5. Left ventricular hypertrophy with strain pattern

d. The mean total QRS vector is calculated by determining the algebraic (plus and minus signs considered) sum of the maximum and minimum points attained during the entire deflection period.

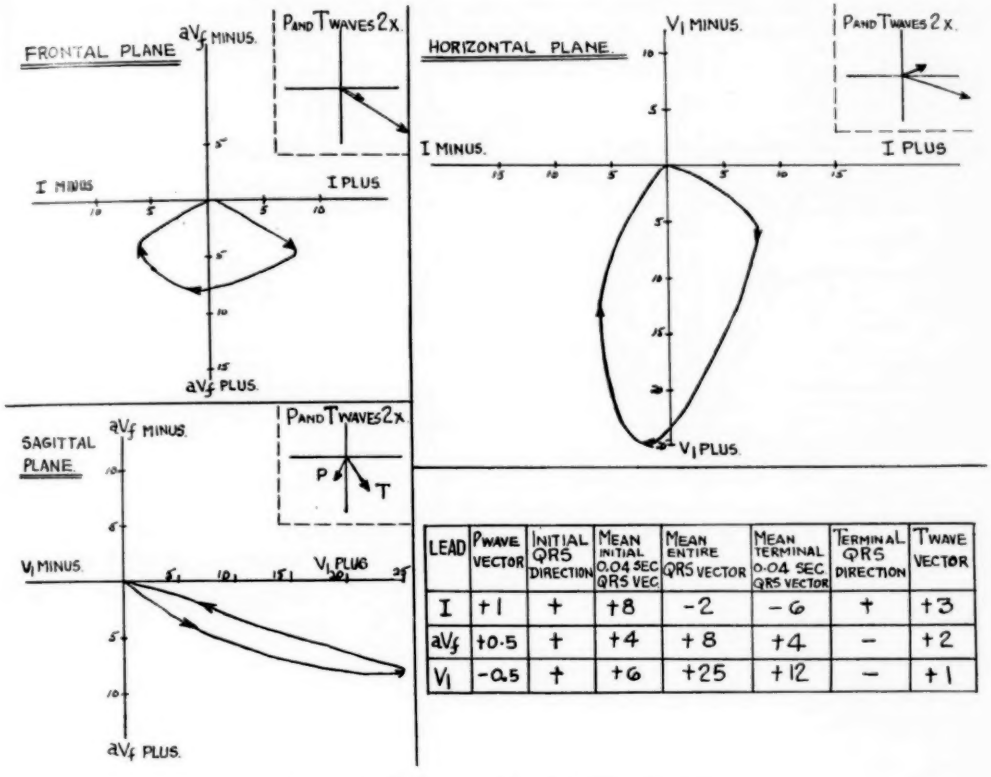
e. The mean terminal 0.04-second vector value is calculated by choosing a deflection in which, although analogous to the deflection chosen in section *c*, the end rather than the beginning of the deflection falls on one of the vertical time lines. Calculations similar to those outlined in *c* are then carried out, but the direction of the analysis is retrograde, proceeding from right to left opposite to the manner in which the tracing was first written.

f. The direction in which the terminal portion of the QRS deflection returns to the baseline is appropriately noted as either plus or minus.

g. In a manner analogous to that cited in section *a*, the mean T-wave vector is calculated and recorded.

j. If the QRS deflection in any lead does not terminate at the isoelectric line but begins an S-T segment either above or below the baseline, the algebraic value of this J point is recorded under *j*.

k. In the infrequent cases in which the QRS interval is longer than 0.12 second, it is possible to utilize the method described in section *c* to calculate and record a middle 0.04-second mean vector value.



LEAD	P WAVE VECTOR	INITIAL QRS DIRECTION	MEAN INITIAL 0.04 SEC QRS VEC.	MEAN ENTIRE QRS VECTOR	MEAN TERMINAL 0-04 SEC. QRS VECTOR	TERMINAL QRS DIRECTION	T WAVE VECTOR
I	+1	+	+8	-2	-6	+	+3
aVf	+0.5	+	+4	+8	+4	-	+2
V1	-0.5	+	+6	+25	+12	-	+1

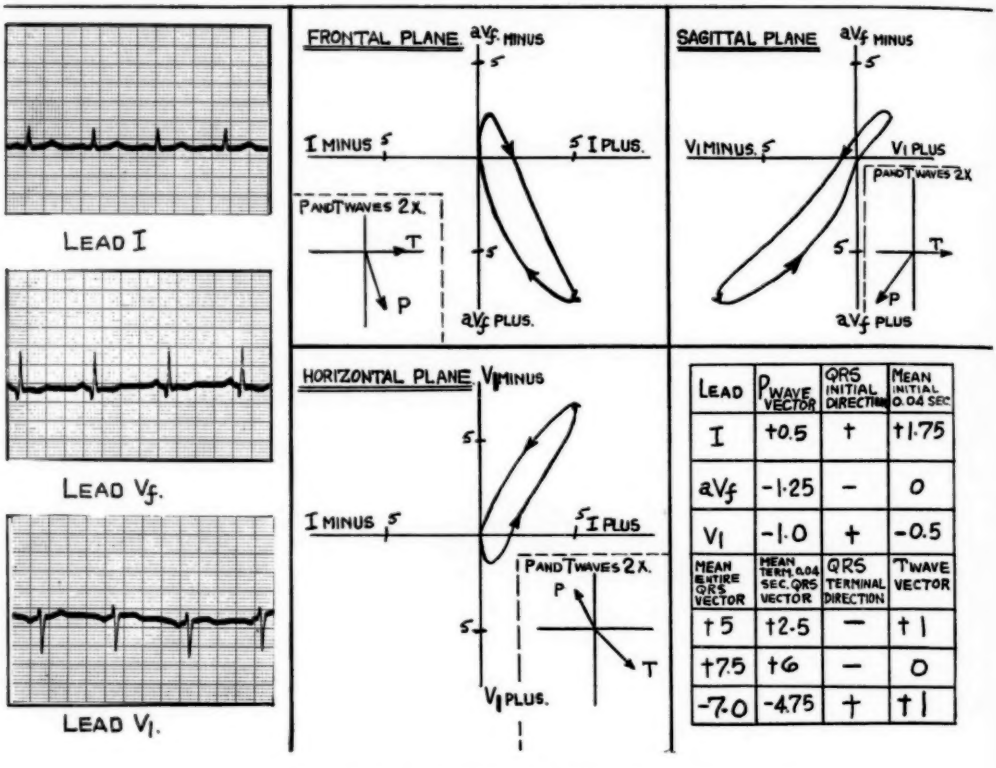
FIG. 6. Right ventricular hypertrophy

Plotting of vector values

The various vector values obtained and tabulated as described are plotted on rectangular coordinate paper, using the customary ordinates and abscissas of plane analytic geometry. Figure 2 and the illustrations following show the general method employed. For the frontal plane, Lead I is assigned the x axis, and Lead aV_f the y axis. For the sagittal plane, Lead V_1 is graphed horizontally, while Lead aV_f continues to be recorded on the vertical axis. For the horizontal plane, Lead I is used as the abscissa, and Lead V_1 as the ordinate. The plus and minus values are assigned on the graph in the same direction as the electrical polarity of the leads used.

As an insert, there is graphed for each plane a magnified pair of P and T waves in an unused corner of the figure. This is done both to clear the central coordinate system for the QRS loop of extraneous arrows, and to depict the P and the T arrows better by increasing their size.

On the central axis pair for each plane, there is first located the (usually) 3 points for which the coordinate values are determined by the grouping of the appropriate lead pair parameters (*e.g.*, mean initial 0.04-second lead I on x axis, and mean initial 0.04-second aV_f vector on y axis for the first point of the frontal plane vector). Then the initial and terminal quadrant directions are checked against parameters **b** and **f**, and a smooth loop is drawn beginning and ending in



LEAD	P WAVE VECTOR	QRS INITIAL DIRECTION	MEAN INITIAL 0.04 SEC
I	+0.5	+	+1.75
aVf	-1.25	-	0
V1	-1.0	+	-0.5
MEAN ENTIRE QRS VECTOR	**MEAN TERM. 0.04 SEC. QRS VECTOR**	**QRS TERMINAL DIRECTION**	**T WAVE VECTOR**
+5	+2.5	-	+1
+7.5	+6	-	0
-7.0	-4.75	+	+1

FIG. 7. Posterior myocardial infaretion

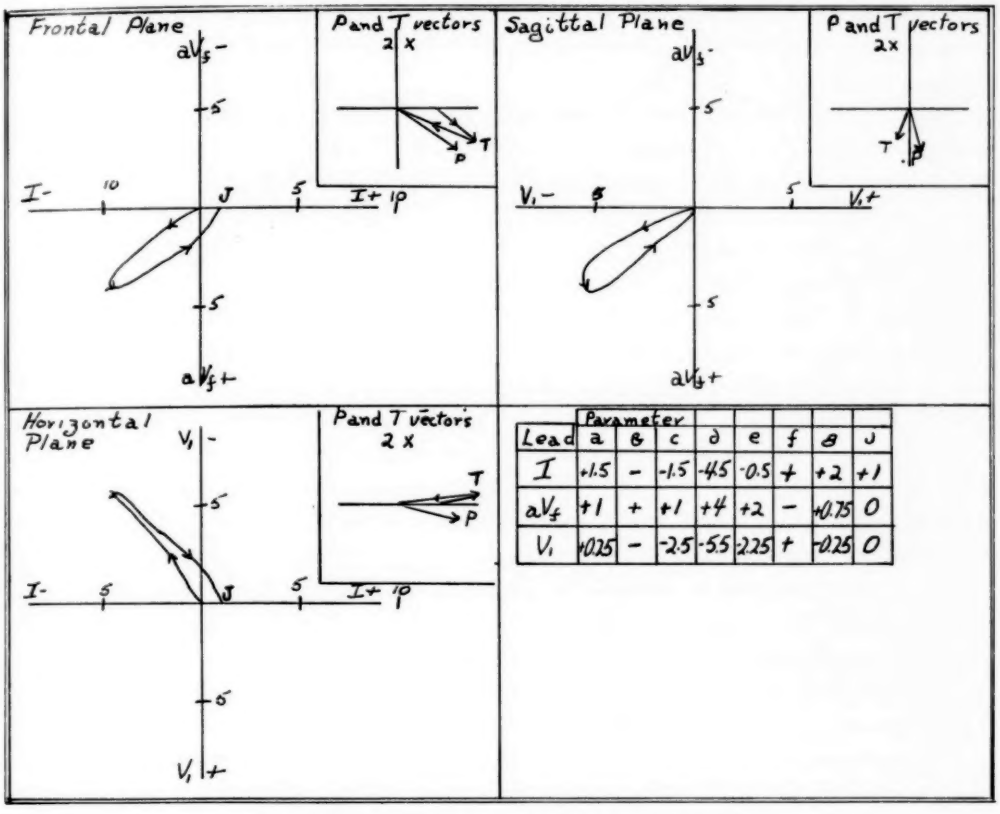
the correct horizontal and vertical directions and connecting the points previously plotted.

At each point plot, there is then drawn an arrow showing the direction of development of the loop. This arrow, in addition to its evident function, also serves as an approximation of the time relationships of the various parts of the vectorcardiogram, since by this method they are located approximately 0.02 second apart on the average loop.

Figure 1 shows graphically an enlarged portion of an electrocardiogram and the points measured to calculate the parameters required by this method. Figure 2 and those following are examples of the derived vectorcardiograms seen in various clinical situations.

RESULTS

Figure 2 is the vectorcardiogram of a 38-year-old white male. It was taken to determine whether any cardiac lesion had occurred during a series of moderate attacks of bronchial asthma over a period of years. The electrocardiogram and the vectorcardiogram are both normal. The vector loops are directed downward, posteriorly, and in the horizontal plane, to the left. The horizontal loop is inscribed in a counter-clockwise direction. In all 3 planes, the mean directions of the QRS loop and the T-wave lie close to each other, implying a normal sequence of ventricular depolarization and repolarization. Although the general direction of



Lead	Parameter a	b	c	d	e	f	g	j
I	+1.5	-	-1.5	-4.5	-0.5	+	+2	+1
aVf	+1	+	+1	+4	+2	-	+0.75	0
V1	+0.25	-	-2.5	-5.5	2.25	+	-0.25	0

FIG. 8. Anterior myocardial infarction—acute

the frontal-plane loop is that for a vertical heart, there is no evidence of abnormal right ventricular proponderance.

The vectorcardiogram in Figure 3 is also a normal one. It was derived from the electrocardiogram of a 29-year-old white male in whose case the final diagnosis was neurocirculatory asthenia. Here again, the loops are directed downward, posteriorly and to the left. The heart lies in a more horizontal position than in the foregoing case. The QRS-T angles appear small. This tracing is presented to illustrate that the parameters derived by this method are sufficient to depict even the figure-8 shape seen in the frontal and sagittal planes of this tracing set. The factors which definitely determine the direction of the loops and hence the existence of the "crossover" are *b* and *f*, the initial and terminal QRS directions. Such a loop is normal, and occurs principally when the spatial loop from which the vectrocardiogram is derived is relatively narrow in comparison to its length, and therefore is more easily "twisted" in the projection process.

In Figure 4, definite abnormalities are evident. The loop patterns are grossly elongated and the frontal-plane loop is largely directed into the upper left quadrant. Although there is normal clockwise rotation in the sagittal plane and counter-clockwise rotation in the horizontal plane, in all planes there is dissociation of the QRS and T angular relationships. This vectorcardiogram, illustrating

left ventricular hypertrophy, was derived from the electrocardiogram of a 56-year-old white male with severe essential hypertension and hypertensive heart disease.

Another example of left ventricular hypertrophy—in this instance, with accompanying left ventricular strain—is seen in Figure 5. The vectorcardiogram is that of a 77-year-old white female with hypertensive and arteriosclerotic heart disease, clinically manifested by moderately severe congestive heart failure. The general characteristics are similar to those in Figure 4. In addition, there are "open" QRS and T loop patterns in the frontal and horizontal planes, produced by the depression of the S-T segments in the Lead I tracing. This failure to close the vector loop can be seen in any situation in which a J deflection occurs in any of the constituting electrocardiographic leads. It is not in itself specifically diagnostic, but must be evaluated with the remainder of the tracing.

In Figure 6 is shown the derived vectorcardiogram of a 4-year-old female with the tetralogy of Fallot. This is a nearly classic picture of right ventricular hypertrophy. The frontal axis is markedly deviated to the right, and the horizontal-plane loop is grossly enlarged and shows abnormal clockwise rotation.

The electrocardiogram from which the loops shown in Figure 7 were derived, was obtained one year after an acute posterior myocardial infarction in a 48-electrocardiographically and by the usual laboratory tests. The vectorcardiogram shows the abnormal initial upward deflection in the frontal and sagittal planes. This represents the effect of the unopposed anterior wall activation forces secondary to the loss of electrically functioning posterior ventricular myocardium. Also evident is discordant depolarization direction, as manifested by the differing year-old white male. The diagnosis was originally well confirmed both clinically, directions of the QRS and T components in all 3 planes. As would be expected from the clinical history, there is no J difference in any plane, the current of injury originally present having long since subsided.

In contrast is the vectorcardiogram in Figure 8, which is that of a 56-year-old white female with a clinical history compatible with an acute anterior myocardial infarction of twenty-four hours' duration. The picture is one of open loop QRS and T waves (in the frontal and horizontal planes), with the return to a positive rather than a negative J point representative of an acute focal myocardial injury. In addition, one can see the abnormal backwardly-directed clockwise-rotating loop in the horizontal plane, and an abnormal left lower quadrant projection of the loop in the frontal plane.

The vectorcardiogram shown in Figure 9 is derived from the electrocardiogram of a 63-year-old white female who had hypertensive heart disease with only mild clinical manifestations. The diagnosis of left bundle-branch block is self-evident in the electrocardiogram, but the derived vector loops also show some changes confirmatory of the diagnosis. As a matter of construction technic, the additional arrow seen on the loop would parallel the increased number of time markers which would appear on an oscilloscopic loop. Their concentration in the terminal portion of the loop implies disease of the left bundle branch. There is also clockwise rotation and terminal "tail" projection in the horizontal loop. The vector-

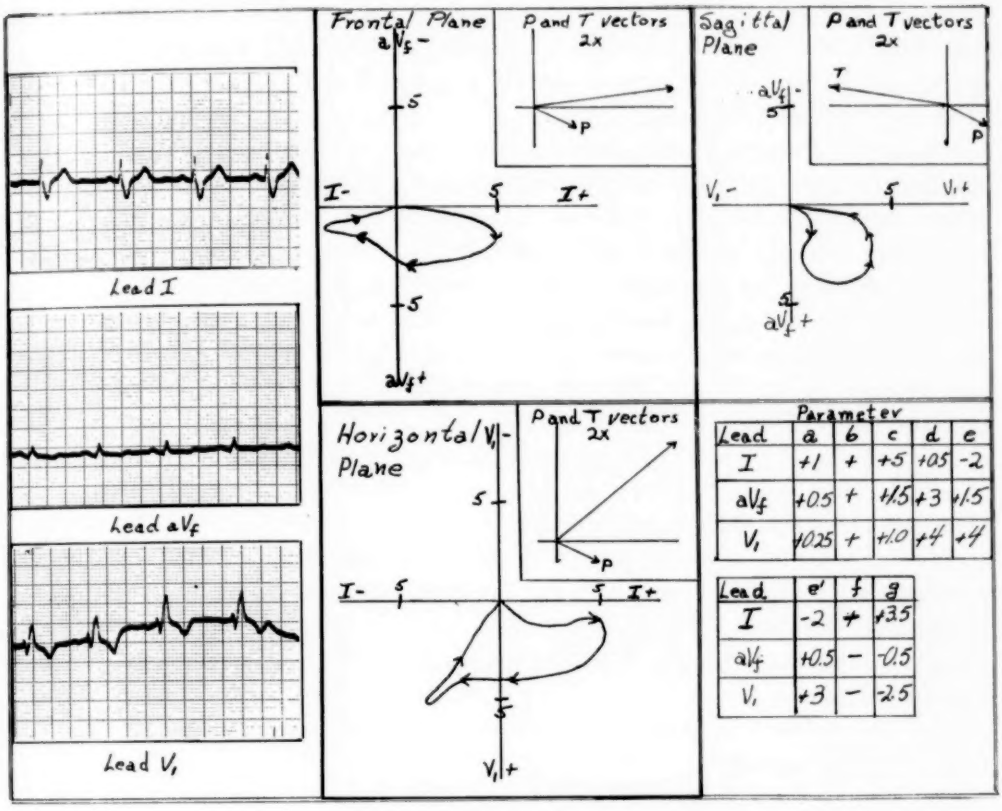


FIG. 9. Left bundle-branch block

cardiogram in either type of bundle-branch block, however, should not be considered as the definitive method of diagnosis, since in some cases the loops cannot be entirely differentiated from those produced by ventricular hypertrophy. In cardiac disease involving conduction defects or arrhythmias, the addition of time as a parameter to the electrocardiogram more than overbalances the lesser amount of spatial information presented in any one lead. The older technic, therefore, is the choice for diagnosis.

DISCUSSION

There are some theoretical, but virtually no practical objections to the method proposed here. Its accomplishment lies easily within the grasp of anyone working with regular scalar electrocardiography. The recording apparatus requires neither multiple channels nor supernormal speed, and tracings of satisfactory detail for the application of this type of analysis can readily be obtained from any good electrocardiograph machine. Co-ordinate paper is universally available, and no special tools are necessary beyond the reading glass and dividers customarily used in interpreting electrocardiograms.

Among the theoretical objections which might be raised are: 1) the lack of simultaneity of the tracings; 2) the masking of small but important deviations

in the tracings, due to instrument inertia; 3) the lack of exact equivalence of the standardization in a combination of bipolar, unipolar and augmented unipolar leads; and 4) the compromise electrode placement which might not be parallel with the reference planes.

All of the foregoing criticisms are valid, but within the frame of reference implicit in the development of a method applicable to any good electrocardiogram obtained anywhere, they are not significant. Furthermore, some of the questions, such as standardization and lead placement, have not yet been settled even in direct electronic vectorcardiography. Perhaps it might be well for those using the oscilloscopic vectorcardiographs to consider using the same lead placements as in clinical electrocardiography in order to provide fruitful cross-referencing between the two fields.

Although multiplication factors, such as 1.5× for the aV_f lead and 1.3× for the V_1 lead could be applied, these factors are only approximations. They would probably vary from patient to patient, and could not in any event increase the inherent accuracy of the derived loops.

Small deviations of the loop may be better visualized on the electronic vectorcardiogram, but such variations are probably caused as much by individual differences between patients as by any underlying pathologic process. This factor, therefore, probably does not subtract from the diagnostic potential of the derived method.

The issue of lack of simultaneous coordinate values is met by the use of the mean vector approach.

On the practical side, the illustrations presented here demonstrate that by this method loop patterns can be derived which will yield information of diagnostic and/or teaching value. Until now, at least, the literature does not contain any important interpretations of the electronic vectorcardiogram which are beyond the reach of the derived method.

As a further benefit, the exercise obtained in interpreting the interrelationships between multiple electrocardiographic leads and their vector-loop progenitor results in a better evaluation of each lead by itself and a better understanding of the underlying electrical events.

SUMMARY AND CONCLUSIONS

A simple geometric method is presented for the derivation of a set of cube-system vector QRS loops and P- and T-wave mean vector arrows from the analysis of 3 mutually perpendicular scalar electrocardiographic leads (I, aV_f and V_1). Included are illustrations of sets of derived vector loops, both normal and representative of various cardiac disease entities.

The merits and drawbacks of the method are discussed. It is concluded that, both as a teaching device and as an auxiliary technic for analysis of the clinical electrocardiogram, the described method warrants attention.

REFERENCES

1. Goldberger, E.: Unipolar Lead Electrocardiography and Vectorcardiography, ed. 3. Philadelphia, Lea & Febiger, 1953.

2. GOLDBERGER, E.: Electrovectorcardiography, *Am. J. Cardiol.* **3:** 124, 1959.
3. GRANT, R. P.: Clinical Electrocardiography; The Spatial Vector Approach, ed. 1. New York, McGraw-Hill, 1957.
4. GRAYBIEL, A.; WHITE, P. D.; WHEELER, L., AND WILLIAMS, C.: Electrocardiography in Practice, ed. 3. Philadelphia, W. B. Saunders Co., 1952.
5. ISAACS, J. H., AND FREIBURN, J. L.: The vectorelectrocardiogram: a simple method of recording and interpreting the spatial electrical fields of the heart, *Am. J. Cardiol.* **5:** 390, 1960.
6. SODI-POLLARES, D.: Modern Bases of Electrocardiography, ed. 1. St. Louis, C. V. Mosby Co., 1956.
7. GRISHMAN, A., AND SCHERLIS, E.: Spatial Vectorcardiography, ed. 1. Philadelphia, W. B. Saunders Co., 1952.
8. LAMB, L. E.: Fundamentals of Electrocardiography and Vectorcardiography, ed. 1. Springfield, Illinois, Charles C Thomas, Publisher, 1957.
9. DUCHOSAL, P. W., AND GROSGURIN, J. R.: The spatial vectorcardiogram obtained by use of a trihedron and its scalar components, *Circulation* **5:** 237, 1952.
10. FRANK, E.: An accurate, clinically practical system for spatial vectorcardiography, *Circulation* **13:** 737, 1956.
11. WILSON, F. N.; JOHNSTON, F. D., AND KOSSMANN, C. E.: The substitution of a tetrahedron for the Einthoven triangle, *Am. Heart J.* **33:** 594, 1947.

MEDICAL, NURSING, RECREATIONAL AND PERSONAL ADJUSTMENT PROGRAMS FOR A SMALL INSTITUTION FOR THE AGED AND CHRONICALLY ILL*

ARTHUR FARBER, M.S.†

Caroline Kline Galland Home, Seattle, Washington

The Board members and the administrator are the people who carry the responsibility for the nature and character of an institution for the aged. The level of service, the quality of the programs and the standards of the home which they direct are dependent upon their basic understanding of the function of their agency in a changing society (1, 2). This appreciation of the needs of the aged people whom their agency is designed to serve is reflected in the provision of the means and leadership necessary to sustain and nourish an effective institutional program.

THE INTRODUCTION AND COST OF NEW PROGRAMS

This paper deals with the medical, nursing, leisure-time and personal adjustment programs in an institution for the aged and chronically ill. Such programs were either minimal or unheard of a generation or two ago, yet today they are practically the justification for the existence of homes for the aged. Not so long ago, the medical and nursing programs were appendages, and they gradually became attached to the home by necessity rather than by design. Even today, recreational and personal adjustment programs are often regarded as frills, and have to be especially underwritten by specific gifts or bequests, or else conceived as "running themselves" through unsupervised volunteers, or by a resident who has had some recreational experience.

The transition of the institution for the aged from a domiciliary and custodial form to a social agency for the care, treatment and rehabilitation of the chronically ill and those in need of protective care, has become more and more of a necessity in every community. This does not make painless, however, the changes that have, and should take place. There are a number of instruments for this change, and the pattern in each community will vary according to its own local and particular situation.

Whenever any institution has been in existence for a long period of time and has developed a history and tradition of its own, it has built-in machinery for its own perpetuation. Persons in power have developed a stake in what they have helped to create to the best of their knowledge and capacities, and the product of their work may have served its function well, until changing circumstances posed new necessities. There may also be a tendency to glamorize and idealize

* Presented at the 23rd Annual Regional Assembly, Western States Region, Council of Jewish Federations and Welfare Funds, Portland, Oregon, January 22, 1959.

† Executive Director, Caroline Kline Galland Home.

Address: 7500 Seward Park Avenue, Seattle 8, Washington.

past accomplishments. This does not mean that we should discard what was valuable in the past and may still be useful. In any event, there is bound to be resistance to the new, not alone because it may supplant the old, but because the new is apt to be more costly. In some ways, it may be much easier to start a completely new institution than to go through the metamorphosis of an old one.

Usually, the change receives its impetus from the developed awareness on the part of Board members for the need to provide the newer types of service. The Board's understanding is helped along by either the central planning body in the community, or the national standard-setting agency. The first step may be for the local institution to request that a professional consultant make a survey of existing programs and offer recommendations. If the pattern in the institution for the aged has been that of a lay Board's direct management of the home, with the use of a matron, superintendent or housekeeping couple, the next most fundamental step in advancing the standards of the institution is the employment of a professional as executive director. The employment of this person, who should qualify as a trained social worker or hospital administrator and who should accept and like older people, is perhaps one of the most essential and crucial responsibilities of the Board.

It is in the employment of the administrator that conviction about the institutional purpose becomes so essential. Not only will his salary have to be higher than that of a matron, but it will be necessary to professionalize and raise the standards of all personnel employed by the institution. Salaries are likely to rise from less than 50 per cent of operating costs to between 60 and 75 per cent, and total costs will also increase.

There may be compensating factors in the increased cost of salaries (aside from humane values and the nature of the care provided). For instance, income may be increased proportionately. Most Jewish homes for the aged receive 70 per cent of their income from payments for services, equally divided between public and private sources. Some homes may not have been availing themselves of public payments. Generally speaking, with the rendering of more specialized service, homes may charge more and thus receive more income. It is noteworthy that in the State of Washington, monthly payments are made as follows:

Group I (heavy nursing care)	$192.00
Group II (moderately heavy nursing care)	$157.00
Group III (moderately light nursing care)	$127.00
Group IV (light nursing care)	$102.00
Board and Room (domiciliary)	$ 68.00

Thus it may be possible, because of these incentive payments, to hire a better qualified and more adequate nursing staff at perhaps no greater net cost.

The administrator plays a decisive role in implementing and putting into practice the evolving policies which the Board formulates. Clarity of purpose and a desire for a fine program of care are most important, but translation from the blueprint stage to the working stage requires skills and knowledge in the field of gerontology and the capacity for attracting, coordinating, supervising and

training a large staff of persons with diverse disciplines and job classifications. It is not enough to employ a good physician, nurse and social worker; they must learn to work together as a team. A good chamber-music ensemble is much more than a group of virtuosi who may not be able to subordinate themselves appropriately. The administrator is responsible for helping to create an atmosphere of understanding, and the development of constructive staff attitudes. In the care of the aged, let us not forget that the client has more hours of contact with the nurse, the waitress, the maid and the janitor than with the supervisory personnel. Unless these employees are selected and trained to understand both their jobs and their attitudes toward the client, good care cannot be rendered.

Among the factors involved in the everyday management of a home for the aged are the following: admission policies; relationships with other agencies serving the aged, particularly the family agency; nursing and medical programming; the use of casework and psychiatry within the institution; problems concerning emotionally disturbed persons and so-called borderline cases; leisure-time activities; and the relationship of the voluntary institution to the level of public services.

ADMISSION POLICIES

Every social agency, in order to operate effectively, should have a defined policy, know its function, and act upon it. There are so many unmet needs of the aged that an institution cannot make up for all the lacks in the general community. If the institution continues to attempt to meet all of the needs for care of older people, it will not only be failing in this endeavor on its own grounds, expanding beyond what it should do, but will be retarding the development of other services by other community agencies. Balance in this respect is necessary. Asking for a definition of agency function is not a request for a rigid set of authoritative rules. A home for the aged should be an adaptable, flexible agency related to the needs of clients with various degrees of emotional and physical impairment.

An institution for the aged must work out its own definition of what it can and cannot accomplish, and who belongs in it and who does not. Such a definition might be: To serve those older persons whose physical condition or social and emotional circumstances necessitate a protected environment, and for whom a non-institutional plan would not be appropriate.

A home for the aged should consider the admission of applicants in the following groups: 1) the healthy ambulatory aged needing protective care; 2) the chronically ill needing long-term, but not hospital care; and 3) the bedfast and infirm needing intensive nursing care. With regard to any of these categories, the home needs to assess its equipment, staff and finances to see if it can provide the appropriate service. It may, for example, assume some responsibility for those who are bedfast and infirm to the extent that it will look after persons who enter under categories 1 and 2 and subsequently need infirmary care, though it may not be ready to offer infirmary service to new applicants. With sufficient under-

standing and planning and as the necessary physical facilities become available, expansion of service to such a bedfast group may eventually be possible.

In general, a home for the aged should not accept following groups: 1) those who do not have the capacity to make their own decisions about coming into the home; 2) those whose limitations require custodial care in a total way, and who are unrelated to their environment; 3) those who do not have the emotional capacity to accept the necessary minimum of medical and nursing supervision; 4) those who may be detrimental to themselves and others; and 5) those with communicable diseases. One can readily see that to administer such policies, it is necessary to acquire a thorough knowledge of the applicants in advance. To obtain a perceptive and confidential social history that can at the same time be constructive and helpful to the applicant, requires the service of professional case work. Institutions which are large enough, and in which there is sufficient understanding of the value of such a program, usually employ their own social case workers to make their admission studies. The smaller and intermediate-sized Jewish institutions, for example, are usually able to work out arrangements with the Jewish Family Agency for this necessary service. When no professional person is employed by the Jewish Family Agency, a working agreement may be sought with the non-sectarian family agency.

Professional studies regarding admission policies are usually presented to an Admissions Committee of the Board. Every Board should ascertain whether an effective professional admission policy is part of its operating procedure, both for the benefit of the client in arriving at a decision regarding entry, and for the protection of the institution.

RELATION TO THE FAMILY AGENCY

There are many non-institutional services which the existing community agencies should offer to the aged, both on a preventive and on a treatment basis. The institution should not be the sole resource or the "catch-all" for every aged person requiring special service. Group living is alien to most people, and good service in an institution is far too costly to be given in undifferentiated fashion. The family agency, the public agency and the hospital extension program help aged people to remain in their own homes through such means as homemaker service, foster home programs, home care and meals-on-wheels, all of which have an important place in the group of services for fulfilling the unmet needs of the aged (3). The liaison and working relationships between the institution and these other agencies, therefore, become vital factors in enabling a community to plan on the basis of the clients' needs.

Although each agency should contribute vigorously towards its goal in meeting present needs and should participate with the central community organization in planning, the initiative and the overall perspective can best be supplied by the latter agency (4).

NURSING AND MEDICAL SERVICE

Nursing service

Even after exclusion of the persons who are too sick to be served in the institution and the persons who are well enough to remain in the community, there is still a broad spectrum of clients ranging from the ambulatory to the bedridden. An important document in giving the picture of trends regarding the medical care of residents in Jewish Homes for the Aged can be found in "Organization of Personal Health Services in Homes for the Aged" by Goldmann and Deardorff (5). The trends are unmistakable in terms of the increasing quantitative and qualitative employment of nursing personnel. The nurse, perhaps more than any other single employee in the institution, has most contact with the client. In the smaller institution, the charge nurse is not only responsible for her own staff of licensed practical nurses and nurses aides, but frequently acts as the assistant administrator, and she is one of the key persons in maintaining a program of high standard. It is invaluable to have as the supervising nurse a woman of maturity who is interested in and dedicated to the care of older people. She must be able to accept aged persons and to be challenged by the problems they constantly present. She is like a barometer or Geiger counter in spotting and referring problems to the physician. She must appreciate what the doctor has to offer and he, in turn, must be sensitive to her point of view when she calls his attention to the symptoms and health status of the patients.

Nursing service is needed not only by patients who are assigned to infirmary beds, but by practically all residents in one form or another. In our Home, for example, 39 of our 40 residents are classified according to the state standards as being in need of some form of nursing home care. Currently, up to 50 per cent and more of residents in Jewish Homes for the Aged require intensive medical and nursing care. There is no doubt that as the proportions of such residents rise in homes—and this is decidedly the trend—costs of medical care will increase (6). Whereas some patients require intensive care because of incontinence or almost constant supervision because of mental confusion, most others require nursing help by way of administration of medications, washing and personal care, and some assistance with feeding.

The Council of Jewish Federations and Welfare Fund made a study of 70 Jewish homes and found that the average number of nursing personnel compared to residents was about 1 to 5, although the variation was large. There were as many as 25 to 30 nurses assigned per hundred beds. It was suggested that the highest ratio be taken as a potential guide.

Medical service

Good medical programming is essential in the care of aged persons in institutions. Medical care must be preventive and continuous, rather than symptomatic and occasional. In cities where homes for the aged exist along with a hospital or other hospital facilities, there should be a close liaison and relationship with these institutions, as there is obviously much advantage to be secured by such an arrangement.

Our own Home in Seattle has had to improvise and work out a program for itself which appears to have many advantages. A medical policy committee was established, consisting of 5 physicians representing the following specialties: internal medicine, general practice, urology, surgery and psychiatry. This representation of specialties is not inflexible. These men were asked to serve because they are respected, experienced practitioners in their own fields. Their basic job is to help shape and evolve medical policy. There is also a paid rotating panel of 4 physicians who are specialists in internal medicine, each of whom acts as the staff physician for a period of four months; thus, each turn comes again after sixteen months. The staff physician conducts a medical clinic for about an hour and a half to two hours, two mornings a week. He is also on call for questions and consultations from the staff, and in case of emergency. He conducts all physical examinations on applicants, and makes semi-annual and annual medical check-ups for the residents of the Home. Every two months, a chart-rounds breakfast meeting is held, at which the 4 staff physicians are present together with 1 member of the medical policy committee. The staff doctor on duty presents the cases of one-quarter to one-third of the residents in the Home. The discussion about the patient's condition is lively and informative. It enables each doctor to keep in touch with the medical status of all of the patients, even when he is not on service, and it provides each of the physicians with the professional opportunity to share his colleagues' opinions about diagnosis and treatment. It has made the care of our patients more interesting to the physician and has enabled the patients, in turn, to receive a higher quality of service.

In our Home, the great majority of our residents are receiving Old Age Assistance. The state has worked out certain drug formularies, so that the team composed of the physician, the charge nurse, the administrator and the medical policy committee has a simplified job to perform in this area—that is, to use these formularies in the most constructive fashion. Recently, through diligent work with our physicians as well as with some of the state authorities, we were able to effect an arrangement whereby the state will pay for some items that are not listed in the formulary. Additional necessary drugs are also given in order to furnish the very best of medications and treatment for a patient's condition.

The physician's attitude toward the aged and chronically ill is of great importance, not only because of the direct impact on treatment and care of the patient, but because the physician's feelings are so apt to influence the outlook of the rest of the staff. Dr. Charles Cameron of the American Cancer Society indicates that physicians, like the rest of the population, can readily convey common attitudes of despair and hopelessness when they encounter recurrent emotional and physical illness in the patient. These attitudes may lead to 1) inertia and the rationalizations "why take money when nothing can come of it?" or "such minor gains are not worth the risks involved in further treatment"; 2) an over-optimism that lets the patient down because of its very unreality; or 3) rigid and brutal telling the truth, regardless of the patient's readiness or capacity to take it (7).

Dr. Cameron points up the problems in such approaches: "There is one grave danger in adopting the attitude of compromise in caring for any patient—even the patient with advanced and seemingly hopeless cancer. Such compromise

may become expedient at some point in the course of cancer. But where shall that point be designated? If it seems best to give up in one case, why not in the next? If prolonging life appears normally unsound in one case, will the same not hold in the next one? When shall the doctor and his team slacken their efforts? Who shall say when the battle is over? The danger is obvious: To reduce therapeutic effort at any time, under any circumstances, is to endorse partial 'therapeutic nihilism.' It is not an unattractive expedient. It saves work, and, better yet, it saves worry. Of course, full commitment to that practice would save the doctors all worry—and, incidentally, all work."

The effort to develop optimistic and hopeful attitudes requires constant and vigorous attention. How can each aged patient be regarded and treated as if he were a celebrity?

In our concern for improving the care of the patient, and in our dealings with the medical and nursing personnel and our medical policy committee, the question of mortality rate has been raised. This is a touchy and complicated subject, and needs to be dealt with in a realistic and responsible manner. The extreme point of view dismisses all accountability with the easy diagnosis which is no diagnosis, namely, "old age." Many patients have multiple and almost continuous complaints which must be recurrently investigated. These can get to be like the little boy's cry of "Wolf, Wolf!" The medical team (doctor and nurse), after investigating the complaint a number of times, may label the person as a "chronic complainer" and underestimate the seriousness of the "alleged" difficulty. It should always be remembered that, especially with the aged chronically ill, no matter what the neurotic overlay or emotional disturbance, the patient eventually dies of a specific (or multiple) illness. Symptoms may be difficult to differentiate, and careful attention by trained and interested professional personnel can literally make the difference between life and death.

The relationship of the administrator to the medical and nursing staff requires a tremendous amount of understanding and diplomacy for the development of the best elements in a working team and high staff morale. The administrator is responsible for the proper functioning of the medical and nursing program, and he should be familiar with and actively interested in each patient's health and care. He is in continuing communication with the doctors and nurses about the ever-changing medical and emotional status of the patients. This vital give-and-take, the encouragement of questions and fresh approaches, the interest in the patient as an individual, and the serious considerations of public health problems, all result in a high standard of health care.

Costs of medical services in Jewish Homes for the Aged

As a backdrop for estimating costs of medical services, it may be helpful to have some general information. Daily operating costs in 6 small institutions for the aged (18 to 46 beds) in 1954 averaged $6.70 per resident, ranging from $5.10 to $7.90. In 12 larger homes (150 to 250 beds) in 1955, daily operating costs averaged $5.12 per resident, ranging from $4.10 to $7.10. However, costs have gone up since 1954–1955 in almost all institutions for the aged. Moreover, the small home

is less economical to run than the larger one. In the smaller homes the total salaries usually take from two-thirds to three-quarters of the total operating budget, whereas in the larger homes the proportion is from one-half to two thirds (6, 8).

Although I do not have medical service costs for the smaller homes, a 1954 study of 6 large institutions showed that there was a fairly narrow range in 4 of the 6; in these 4, the medical salaries constituted about 50 per cent of all salary costs. At the Galland Home in 1959, medical and nursing salaries constituted about 53 per cent of our salary budget. Medical expenditure for salaries, supplies and expenses tends to amount to about one-third of the total operating budget, and therefore is *the* most expensive item in the costs of management of the modern institution for the aged. In any discussion of per capita, per diem figures, comparisons with a particular home should be made with caution, since there are at least four important variables: 1) variations in resident population as to sickness and need for intensive care, as well as services being offered; 2) the extent to which other community services, including medical case work and group work, are available without cost to the institution; 3) the size of the institution; and 4) the regional and local factors regarding labor, materials, food and other costs (6).

USE OF CASE WORK AND PSYCHIATRY WITHIN THE INSTITUTION

Case work

Professional case work is extremely important in the admission procedures of a Home. Placement in an institution, in itself, involves a difficult separation process for even the healthiest of persons with a positive motivation for giving up his previous way of life. Case-work help for three to six months for each new resident and his family is thus a necessary service; even a longer time may be needed for some clients. With the onset of new illnesses and medical conditions that inevitably take place, the traditional skills of medical social work are required. A basic conviction and knowledge about the applicability of case-work aid for aged persons is needed, as well as administrative sanction, if such a program is to prove helpful to the client.

Up until last fall, the Jewish Family and Child Service staff was providing case-work services to residents of the Galland Home. The agency was giving the Home from two and a half to three days a week of professional time in active supervision of about 20 cases (half the resident population), in addition to taking care of admission work. This was a valuable contribution. In order to maintain the proper kind of liaison between both agencies, we conducted monthly meetings at which were present the family agency staff, the Home staff physician, the charge nurse and the administrator. Usually, one of the social workers presented a case and gave a summary of contacts; this was followed by discussion. In addition to these monthly staff meetings, workers from the family agency were in almost weekly communication with the cook, charge nurse, doctor, administrator and other personnel of the Home concerning their cases. The workers also received supervision from the administrator in regard to cases under care. Carbon

copies of the current interviews were sent in advance of regularly established conferences, and the Home was able to have its own record of case-work contacts.

More recently, the Galland Home and the family agency were able to work out an arrangement for the Home to have its own case worker on a part-time basis. The Home has benefited by having a worker, all of whose professional time is spent in helping the residents and their relatives, and in work with the staff. In addition to individual interviews with clients, there has been group work in developing some features of self-government by means of a Good and Welfare Committee, and several other projects. Also, the Home has a second-year graduate student from the school of social work. In a small institution, it is particularly helpful to have an administrator who is professionally equipped to offer case-work supervision, and is prepared on occasion to do case work himself. Although the administrator has to maintain contact continually with each of the residents, this is not a substitute for a planned case-work service.

The following is an illustration of how case work may help: *Mrs. F.* was an 88-year-old woman with a history of having had a tumor removed some three years before coming into the Home. She had been widowed for many years and had no living relatives. She needed to cover up her dependency needs with a pose of superiority, so she isolated herself from the other residents by getting into pitched verbal battles. When her gastric symptoms became more intense, she threatened to leave the Home. Her complaints about the food were quite unrealistic, but nevertheless loud and vituperative; suspiciousness and great distrust were evident. Her case worker, having established a warm and accepting relationship with her, was able to help her undergo a medical check-up and referral for an intensive gastro-intestinal work-up in the county hospital. Despite the client's disclaimers that she didn't care if she died, the social worker was able to get her to express her fear that she was going to die of stomach cancer, as had her husband. Her brave front crumbled as she cried it out with her case worker. No longer alone, she could face the reality of her medical condition. In this instance, there was good news from the doctors; thus her anxiety tended to be less displaced regarding food and her relationships with the other residents. Because of Mrs. F's experience with her case worker, she felt more comfortable in the Home, and had a sense of belonging that had been absent previously.

Psychiatric consultation

For almost a year we have employed the skills of a consulting psychiatrist for about four hours a month. His time is used in a variety of ways, *e. g.*, to deepen the understanding of disturbed personalities, and to find more effective ways of dealing with cases of upset behavior. The psychiatrist attends the training sessions with the nursing staff, which are held on a monthly basis. His time is also used for diagnostic evaluation and suggestions regarding therapy for individual patients; he sees the patient on some occasions and has discussions with the case worker at other times.

THE DISTURBED AND DISTURBING PATIENT

Whatever the diagnosis, whether it be senility, mild psychosis or disturbed and disturbing behavior, what is the responsibility of the voluntary institution

in caring for such persons? One of the facts that has impelled the voluntary institution to take responsibility for patients in this area has been the inadequacy of solutions under public auspices. The standards of care for the disturbed aged and the senile patient in state hospitals have been woefully inadequate. In reaction to this state of affairs, and because of the resistance on the part of families to commitment to state institutions, tremendous pressure has been exerted to care for this group of persons otherwise. With proper administrative sanction, the development of staff understanding, the employment of auxiliary health specialists, and recognition of the bounds within which effective help can be given, much constructive programming can be done in working with these so-called borderline cases. Ultimately the responsibility should again come under public auspices, in order to underwrite the care of this group of patients (often done through qualifying them under nursing classification payments), and/or to improve the public facilities. There are some states, such as New York, that are actively considering the establishment of "homesteads." These will be separate facilities for the disturbed aged person, so that commitment to state hospitals will not be necessary.

The value of psychiatric consultation is illustrated by the following case: *Mr. S.*, a 75-year-old man, was admitted to our Home about two years ago. He was scheduled to go to a state hospital. His 4 adult children and their families had found it impossible to keep him in their own homes, and he had "failed" in 4 proprietary nursing homes because of his severe behavior problems. This man, who spoke primarily Yiddish (it was later ascertained that he was able to communicate in English in a minimal way with our non-Jewish staff), got into loud altercations and displayed obstreperous behavior with the other residents and particularly with the nursing and dietary staffs. We had asked for a psychiatric diagnostic examination before his admission, and it was found that Mr. S. was not psychotic in spite of his obvious emotional disturbance. An incident during his first week at the Home may illustrate his lack of socialization; the charge nurse saw him on all fours eating a spilled soft-boiled egg from the floor. However, real progress was made through intensive case-work help and cooperation of the staff, especially the nurses who had constantly to administer to his multiple medications and attend to his insatiable demands for care on the most infantile level. Today he is accepted as one of the regular residents despite his difficult behavior pattern and occasional flare-ups. He now considers this to be his home and has been able to modify his behavior and get along better than his family or we might have expected.

RECREATIONAL AND LEISURE-TIME ACTIVITIES

Programs of this nature are vital in preventing unnecessary and costly human decline. The value of participative, rather than passive, use of leisure time is an important principle. To be successful in activating eyes and hands that have been fallow, or spirits that are pessimistic, insecure and despairing, requires a program with professional supervision. In most communities, the availability of staff members from a community center is a ready resource. This service to the aging on the part of a Jewish Center, however, involves no monetary return in terms

of fee payments by the client group. Therefore, it is most essential that the Center have a conviction about the importance of programming for these clients.

Extension service by Jewish Centers to homes for the aged, as well as other settings, has become an established practice. When this can be worked through on a mutually satisfactory basis, it can be most productive to both agencies. It is essential that the group worker from the Center be given administrative support to operate within the Home setting, and that this worker have a liking for, and interest in working with the aged. When such a worker cannot be obtained from the Center, the institution should employ its own worker, but the costs of doing so on a professional level are high for the smaller home. Where there is conviction, however, it can be done. For example, special gifts can be obtained by women's auxiliaries or individual gifts can be earmarked for this purpose. Once the funds are available, there may be problems in recruiting trained personnel. Here the professional leadership of the administrator can be important in selecting and finding personnel, provided the Board has established policies which are enlightened and will underwrite the type of service desired. Improvization may be necessary in the smaller home. If there is a worker on the staff who has skill in the group process but is deficient in arts and crafts abilities, it is possible to provide for the latter type of program by means of session workers and volunteers operating under the supervision of the group workers.

THE VOLUNTARY INSTITUTION IN RELATION TO THE LEVEL OF PUBLIC SERVICES

Voluntary institutions are directly affected by the level of public welfare programs, and by the direct monetary payments they make to qualified residents. Experience in the family agency field has demonstrated that the private agency simply is unable to foot the bill for basic relief needs, though before the great depression of the 1930's this had been its primary function. Public payments for service are a major source of revenue for institutions for the aged. Not only do these direct payments make possible a more adequate nursing and medical program, but frequently the public agencies, because of their control of the purse strings, have contributed towards raising the levels of care by their requirement that certain minimal standards be met.

We can take a page out of the book of the Washington State Nursing Home Association in regard to the stake held by the well-run nursing home in raising standards. The nursing-home group, including commercial and nonprofit institutions was alive to the implications of creating a more favorable public image; therefore it helped to secure more equitable rates for care from the legislature, and showed genuine interest in working towards improved conditions and practices. It is interesting that the licensing agency (the Hospital and Nursing Home Section of the State Department of Health), which is concerned with the administration of the Nursing Home Act, finds that it can work effectively in concert with a responsible self-regulating group such as the Nursing Home Association. These agencies have jointly conducted educational workshops for staff training.

There has been recent discussion in the Jewish institutional field concerning the development of a national association for non-profit homes for the aged. Apparently there is interest in this development on the part of the Department of Health, Education and Welfare in Washington, D. C. Undoubtedly there is need for effective channels of communication between federal, state and local public agencies and voluntary agencies, with the aim of raising the level of services and care for the ever-increasing numbers of aged and chronically ill patients in institutions.

Active community leaders and members of Boards of homes for the aged have an important role to play, not only in such associations, but on local Health and Welfare Councils and on Governor's Legislative Committees on the Aging, as well as in geriatric and gerontological societies. All of these forms of membership can serve useful functions in both learning from and contributing to others, and in advancing the services to this Number One priority group—the aging.

SUMMARY

Responsibility for leadership in the development of modern facilities and programming for small homes for the aged and chronically ill rests with enlightened understanding by the Boards and administrators of these institutions. Medical, nursing, leisure-time and personal adjustment programs for such a home are outlined. Important considerations are the criteria, policies and processes of admission, and the relationship with the family agency. Various aspects of nursing, medical casework, psychiatric and creative activity programs are discussed, as well as the relationship between voluntary institutions and public services.

REFERENCES

1. Standards of Care for Older People in Institutions (three sections). The National Committee on the Aging, National Social Welfare Assembly, New York City, 1954.
2. Zelditch, M.: The Home for the Aged. Unpublished mimeographed report, Council of Jewish Federations and Welfare Funds, New York City, April, 1957.
3. Farber, A.: Non-institutional Services for the Aged, *Social Work* **3:** 58 (Oct.) 1958.
4. Kaplow, H. L.: Development of a Community Program for Serving the Jewish Aged in St. Louis. Presented at the National Conference of Jewish Communal Service, Chicago, May 18, 1958.
5. Goldmann, F., and Deardorff, N.: Organization of Personal Health Services in Homes for the Aged. Unpublished mimeographed report, Council of Jewish Federations and Welfare Funds, New York City, April, 1958.
6. Unpublished information and correspondence with the Council of Jewish Federations and Welfare Funds and Western States Region of the CJFWF, New York City.
7. Cameron, C. S.: Professional Attitudes and Terminal Care. Cancer Society's program, National Conference of Social Work, Chicago, May 27, 1952.
8. The Small Home for the Aged—Cost and Staffing. Unpublished mimeographed report, Council of Jewish Federations and Welfare Funds, New York City, March, 1956.

Abstracts of Current Literature

TENSION STATES IN THE AGED AND INFIRM.

Adler, J. *J. Tennessee State M.A.* **53:** 1 (Jan.) 1960.

From a tendency to study and attempt to treat only major mental disorders in elderly persons, a shift is occurring to the necessity for understanding the facts and factors that precede the outbreak of major manifestations. Many of the changes in behavior in elderly persons are not the result of aging itself. Younger persons would react in the same way if they had to face the same situations: being dislodged from their rightful places, suffering social, economic and business disadvantages, loosing economic status, friends and relatives, being in the way, and having difficulty with body functions. Neuroses and tension states are common in the aged but they have received less attention than the major mental disorders although they are more numerous. Advancing age may cause anxiety states and other psychoneurotic reactions. Many of these resemble reactions shown by the individual in earlier life. A neurotic pattern of middle age and earlier life is likely to be repeated with greater severity in later life. The causes of these neurotic reactions and tension states are maladaptations to such things as the slowing down of body processes, the decline in mental performance, atrophy and discoloration of the skin, changes in internal organs, loss of physical vigor and endurance, and the loss of physical attractiveness. It is untrue that old age is identical with the loss of sexual activity and interest but waning sexual vigor may result in disappointments and feelings of inadequacy. Moral crusades are a common neurotic outlet for a sexually frustrated elderly person. Another pathologic outlet is infantile preoccupation with sex. The failure of sensory faculties lessens one's contact with the environment and this produces misunderstandings and misconceptions which lead to anger, fear and discouragement. Preoccupation with inadequate function of the internal organs may cause hypochondriacal reactions. Other important factors are the deficiencies in emotional life. Many of the emotional changes in the elderly are believed to be due to organic changes. It is also true that the emotional reactions in many elderly persons occur in a much more shallow fashion than experienced at an earlier age. It is difficult to attribute this to organic deterioration because it may in part be due to the fact that the person has learned to take disappointment in his stride. Aside from biologic factors which may produce psychoneurotic reactions, cultural factors are important. To become dependent is one of the most unpleasant events in life. Other upsetting events that result in anger, depression and tension are the loss of free choice, relocation such as moving from an accustomed home, difficulty in making new friends, the loss of social and economic significance and prestige, the loss of position, and having to give up a home. As a means of compensating for reduced status, an elderly person may become overly aggressive, develop hypochondriacal complaints, and demand special privileges. Retirement from work is frequently likely to precipitate unpleasant neurotic reactions. Too early retirement tends to aggravate many existing tensions and may reactivate old ones. The feelings of being unnecessary and unwanted that come with retirement will result in restlessness, depression and resentment. This requires that the person prepare for this shift of interest and activities by the development of hobbies long before he reaches retirement age. Society needs to be educated that the abilities of the elderly have not disappeared and that old people still are capable of great accomplishments. Treatment of a neurotic state in elderly persons is neither useless nor hopeless. It can produce satisfactory results when directed toward the actual cause of the neurotic tension state and its removal. Due attention must be paid to the person's physical condition, which should be improved when indicated. Social rehabilitation with the help of social agencies, clubs and guidance clinics can improve the lot of the aged population and reduce

the incidence of neurotic reactions. It should not be regarded as useless to treat an aged person medically or psychiatrically. However, it must be remembered that the personality characteristics with which an aged person enters senescence and senility may in themselves be sufficient to produce or reproduce neurotic reactions. The individual determines to a large degree the favorable or unfavorable outcome of the therapeutic approach.

THE RECOGNITION OF EARLY ILLNESS IN THE ELDERLY.
Bay, E. B. *M. Clin. North America* **44:** 275 (Jan.)1960.

Differences are stressed between the signs and symptoms of the more important diseases occurring in older and younger patients. *Circulatory diseases*: These constitute more than half of the diseases affecting persons past the age of 50 years. 1. Coronary disease. This is likely to be more subtle than in a younger person, the sensation in the chest seeming like an ache or feeling of fullness or pressure rather than excruciating pain. "Silent" coronary occlusions occur slightly more frequently in older persons but not as often as textbooks indicate. The electrocardiogram is typical, but the drop in blood pressure may be greater and the transient fever and leukocytosis may be higher. 2. Arteriosclerotic cardiovascular disease. The pathologic development is insidious but the first manifestation may occur suddenly as a disturbance of heart rhythm or onset of frank heart failure, or both. Auricular fibrillation with a rapid heart rate or complete heart block with a slow rate may be the first incident. Early recognition of auricular fibrillation may forestall the development of congestive heart failure by restoring normal rhythm through the use of quinidine or by slowing the ventricular rate with digitalis. Congestive heart failure with an arteriosclerotic basis may progress gradually or arise full-blown. Its peripheral manifestations are likely to be singular rather than multiple. The single sign may be rales in one or both lung bases, an enlarged tender liver, edema of the ankles, or pleural effusion. A clue to impending heart failure which is frequently the first symptom is exhaustion. Digitalization and moderate salt restriction with the use of diuretics in some cases will achieve compensation. 3. Cerebrovascular accidents. Detecting the tendency to strokes involves distinguishing between multiple small and evanescent real strokes and central nervous system symptoms of other origins. When the latter are organic, their early diagnosis is important. When they are functional, the common symptom is dizziness which is likely to occur with sudden changes of posture such as getting out of bed too fast. Multiple small cerebral accidents usually are of thrombotic origin. The objective signs may be transient paralysis of one or more muscles of extraocular movement unilaterally. They portend a major stroke sooner or later. Treatment is controversial: In the presence of hypertension, lowering the blood pressure may promote a tendency to further clotting. Prophylactic anticoagulant treatment may exaggerate the hemorrhagic zone that frequently surrounds the brain area damaged by thrombosis. 4. Peripheral arterial diseases. The common ones that are sometimes neglected are considered. Hardening of the arteries in a person with diabetes is often missed in the early stages. The finding of glycosuria upon routine analysis should indicate an examination of the pedal pulses. When the circulation is poor, caution about injury and infection may prevent or postpone vascular surgery. Intermittent claudication should be diagnosed early because it is reversible. The pain may not be sufficient to keep the patient from walking, and it may not be limited to the calves but appear in the ankles, feet or thighs. Exercises and abandonment of smoking are of benefit. *Digestive diseases:* 1. Esophageal disease. Any hint of difficulty in swallowing solid food warrants upper gastro-intestinal fluoroscopy and roentgenographic examination because esophageal cancer is amenable to surgery and the five-year cure rate is high. The diagnostic accuracy of exfoliative cytologic study may exceed 95 per cent. The diagnosis of esophageal diverticula and hiatus hernia is essential, since both can be treated surgically. 2. Diseases of the stomach. The early diagnosis of carcinoma of the stomach presents a difficult problem. The majority of physicians do not routinely make microfilms of the stomach in the absence of symptoms. Ulcer of the stomach or duodenum occurs frequently enough in the elderly to make early diagnosis worth while.

These patients usually respond well to medical management. Carcinoma of the small bowel should be suspected when there is anemia and persistent occult blood in the stools but no signs of obstruction. These tumors tend to metastasize late. An exploratory laparotomy may be justified. 3. Diseases of the colon. Carcinoma of the colon is more frequently correctable in its early stages. It may be painless, but it induces changes in bowel habits that lead to obstruction in neglected cases. This carcinoma is most likely to be missed in patients with a history of hemorrhoids. Proctoscopy is an important diagnostic procedure. To distinguish diverticulosis from diverticulitis of the colon, it should be known that fever of low grade, tenderness on palpation of the colon, and general malaise usually accompany diverticulitis. *Renal and genitourinary diseases*: Renal failure in the elderly may develop insidiously and urinalysis may fail to reveal its presence. It may develop in the course of hypertension or arteriosclerotic cardiovascular disease, ascending pyelonephritis, and renal stones. Since the early symptoms may be vague, the levels of blood nonprotein nitrogen and urea nitrogen should be determined when these disorders are known to be present. Sluggish mental reactions and unexplained vomiting can be early clues. Hematuria should be investigated promptly. Appropriate tests may show tumors of the kidney or urinary bladder. Simple digital rectal examination will detect enlargement of the prostate as well as be of value in detecting early carcinoma of the prostate. Routine pelvic examinations are urged in women past 40 years of age, since carcinoma of the cervix when present usually can be found and cytologic studies will detect carcinoma in higher locations. *Pulmonary diseases*: The increase in lung carcinoma in recent years and improved surgical procedures make its early diagnosis important. Still not enough people are reached by roentgenogradhic examinations. *Central nervous system diseases*: Early recognition of senile dementia and proper evaluation from time to time can make great differences in the lives of patients. Occasional lapse of memory for recent events is an early symptom which may remain isolated for years. Its progression can be very slow or very rapid and this requires early recognition in order to avoid serious difficulty.

ULCERATIVE COLITIS IN OLDER-AGE PATIENTS. DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, AND TREATMENT.

Bercovitz, Z. T. *New York J. Med.* **60:** 828 (March 15) 1960.

The primary disease may occur after age 50, or ulcerative colitis may exist in chronic form for many years. The former is a serious disease that frequently is acutely fulminating and rapidly progressive. A colectomy can become necessary within a year or two after onset. Watery diarrhea or rectal bleeding may be the first symptom. The patient may be acutely ill and have diarrhea with blood, mucus or pus, rectal pain, straining, tenesmus and abdominal cramps. Most older patients lose control of the rectal sphincter. Some have symptoms resembling obstruction of the colon. The course of the acute disease varies; it is more serious the older the patient. There may be severe and prolonged diarrhea accompanied by weight loss and debilitation, or hemorrhage from the bowel may occur. The disease may be localized in the rectum, sigmoid, or distal descending colon. In these instances, the symptoms are likely to be severe. They usually respond to therapy, but in time the colon may show areas of narrowing with evidence of partial obstruction. Patients with initial evidence of intestinal obstruction must be given saline laxatives and observed carefully in order to prevent obstruction from becoming complete. *X-ray diagnosis*: The roentgenographic appearance of chronic ulcerative colitis is well known, but that of the acute disease differs. The only completely pathognomonic sign is ulceration. During acute inflammatory stages, the affected area may be dilated or redundant. The areas may appear relaxed without tone, or stiff after repeated episodes of inflammation. Normal haustral markings may be diminished or absent. There can be diminished haustration on one edge of the colon and a stiff straight line opposite. Mucosal patterns tend toward a coarse irregular appearance followed by the development of longitudinal lines parallel to the long axis of the bowel in the in-

volved portions. When the disease is localized, unaffected areas may appear normal. *Differential diagnosis*: Diseases to be distinguished include carcinoma and carcinoid tumors of the gastro-intestinal tract, diverticulitis of the sigmoid or descending colon, partial obstruction of the colon, polyps, staphylococcal enterocolitis, Shigella (bacillary) dysentery, amebic dysentery, regional ileitis, malabsorption syndrome, duodenal ulcer, postbulbar duodenal spasm syndrome and chronic pancreopathy. The differential diagnosis also includes distinguishing the complications that may develop. Bleeding from the bowel is most commonly due to carcinoma, diverticulitis, polyposis, chronic ulcerative colitis, duodenal ulcer or gastric ulcer, gastric carcinoma, or esophageal varices. *Carcinoid tumors* can be identified by finding serotonin in the urine. *Diverticulitis* of the sigmoid or descending colon is a common cause of symptoms resembling ulcerative colitis. Partial intestinal obstruction may be present. The diagnosis must be confirmed by roentgenographic studies, including air contrast films. Repeated episodes of partial obstruction of the sigmoid colon, with roentgenographic evidence of progressive stiffness, may require an exploratory operation in order to make the diagnosis and relieve the patient. *Partial obstruction* of the colon may result from carcinoma or chronic inflammation with scar tissue causing localized stricturing. Obstruction due to carcinoma or endometriosis of the sigmoid can only be distinguished by the microscopic examination of specimens obtained at operation. In *staphylococcal enterocolitis*, bowel movements are copious with great loss of fluid. In *Shigella dysentery*, there is frequent passage of small amounts of sticky blood, mucus and pus. *Amebic dysentery* shows a milder clinical picture. Endamoeba histolytica can be found in the stools, of which there are 6 to 8 daily with clear, glairy blood-streaked mucus. Pro-Banthine administered before roentgenographic examination facilitates the diagnosis of *duodenal ulcer* when this is the cause of diarrhea. In older patients with *postbulbar duodenal spasm*, profuse and watery diarrhea without blood or mucus may be the predominant and presenting symptom. Important in diagnosis is roentgenographic evidence of stiffness of the postbulbar area with narrowing, constriction and spasm. There is also marked hypermotility of the small bowel. *Treatment*: Medical management involves problems not encountered in younger persons. Arteriosclerosis, cardiovascular complications, and glaucoma, when present, must be evaluated. The loss of electrolytes, proteins and fluids that may be caused by diarrhea requires replacement by intravenous infusions. Blood transfusion often is indicated and must be used in case of massive hemorrhage. Vitamin K and ascorbic acid also are indicated. Premarin has been used to control intestinal bleeding. The basic therapy includes antibiotics, antispasmodics, and anticholinergic agents. Chloromycetin is given prior to surgery in acute fulminating cases and prior to emergency surgery. Older patients may receive corticosteroids at the onset of the disease or during the exacerbation of chronic ulcerative colitis, but their use requires caution in order to avoid complications such as hemorrhage, perforation, and sudden change from a mild form to an acutely fulminating condition. The intrarectal instillation of prednisolone may have good results, especially in patients with serious rectal and sigmoid involvement. Corticosteroids have a place in the pre- and postoperative management of elderly ulcerative colitis patients whose adrenals have been depleted by the disease. When sedation cannot be accomplished with barbiturates, a combination of diphenhydramine hydrochloride or dimenhydrinate with chloral hydrate may facilitate rest. Older patients must be encouraged to eat full, regular meals and must understand that food does not cause the bowel disturbance.

HOLISTIC APPROACH IN THE MANAGEMENT OF ANGINA PECTORIS.

Eskwith, I. S. *Postgrad. Med.* **27:** 203 (Feb.) 1960.

The plan of therapy termed the holistic approach consists of paying careful attention to the patient's emotional, occupational and dietary needs and enforcing limitation of activity in patients with organic cardiac changes. No vasodilators are used; a tranquilizer (meprobamate in a dosage of 400 mg. three times daily) is given instead. Patients are hospitalized when either an infarction or a sudden increase in anginal episodes occurs. The only other drugs used are anticoagulants in some patients at the time of hospitalization and nitro-

glycerin for acute anginal attacks. A series of 26 men and 4 women of average age 59 years was followed for periods of six to seventy-two months (average nineteen months). The criterion for improvement was reduction in daily anginal attacks. Twenty-one patients (70 per cent) were greatly improved, 3 patients (10 per cent) showed moderate improvement, and 2 patients were unimproved. Four patients died while under observation. Twenty patients are fully or partly employed. Four of 7 unemployed are in the greatly improved group and are unemployed because of advanced age. No instances of cardiac arrhythmia occurred in the series. Eight patients were hospitalized at some time because of anginal exacerbation. The author believes that the holistic approach is the method of choice in angina pectoris, since surgery appears to offer no better results and has an inherent risk.

METASTATIC TUMORS OF THE PERICARDIUM.

Genovese, P. D., and Fouts, D. B., Sr. *J. Indiana State M.A.* **53:** 267 (Feb.) 1960.

The more common patterns associated with neoplastic involvement of the heart and pericardium are reviewed. The incidence of cardiac metastasis has been reported as 0.24 to 6.45 per cent among all necropsies, but from 2 to 21 per cent among necropsies based upon total number of malignant tumors. Metastases to the heart and pericardium may arise from a malignant neoplasm in almost any organ but they originate from tumors of the bronchus and breast, malignant melanoma, and the lymphoma group in approximately 75 per cent of cases. Cardiac metastases occur by direct extension from neighboring intrathoracic organs, by embolization from the primary tumor, or by retrograde lymphatic extension. Pericardial metastases are more common than myocardial metastases, and endocardial metastases are rare. Metastatic invasion of the heart and pericardium may occur in any age group. Although antemortem diagnosis may be difficult, congestive heart failure, cardiac arrhythmia, or cardiac tamponade or compression should suggest the diagnosis, especially in patients with a known malignancy. An important method in establishing the diagnosis is the demonstration of tumor cells in the pericardial fluid, when this is present, by the Papanicolaou technic or by section of the sediment. Angiocardiography, fluoroscopy and kymography may help to differentiate tumor from aneurysms. Seven case reports are presented. Patient 1 had a malignant lymphoma of the reticulum-cell sarcoma variety with metastases to the pericardium and the right wall of the heart. The incidence of cardiac involvement in malignant lymphomas and leukemias is high. One patient with bronchogenic carcinoma with metastases to the pericardium had an acute pericardial effusion which presented a problem in differential diagnosis. The early invasion of the pericardium showed the importance of early diagnosis in determining the proper therapeutic program. In Patient 4, testosterone therapy was beneficial even after metastasis to the pericardium had occurred. The metastatic disease was controlled by instillation of nitrogen mustard into the pericardial space; pericardial effusion ceased to be a problem. In Patient 5, metastases to the heart and pericardium arose from carcinoma of the cervix, a rare occurrence. In Patient 6, a mid-thigh amputation had been performed for Ewing's sarcoma, followed in three years by thoracotomy for a metastatic lesion in the left upper lobe and after seven years by roentgen-ray therapy for a left hilar mass. There was a dramatic response, the patient becoming asymptomatic. Despite indications of the presence of pericardial metastases, no metastatic disease could be demonstrated histologically. This patient is an illustration of long-term survival. The usual survival time in a case of this tumor is three years postoperatively. It also illustrates that continued treatment of metastatic lesions is worth while. Patient 7 illustrates a rare circumstance: pericardial metastasis from carcinoma of the thyroid. A high index of suspicion is necessary if pericardial metastasis is to be diagnosed ante mortem. Whenever possible, the primary lesion should be determined in order that the most effective type of therapy may be chosen for the specific type of neoplasm. The instillation of nitrogen mustard or a radioisotope, or roentgen-ray therapy, may be more advantageous in one case as compared with another. The development of pericardial metastasis, although a serious

complication and a poor prognostic sign, is not a hopeless situation, and the careful use of the therapeutic means available may provide temporary improvement and may prolong life.

PROGNOSIS OF PATIENTS SURVIVING FIRST CLINICALLY DIAGNOSED MYOCARDIAL INFARCTION.

Juergens, J. L.; Edwards, J. E.; Achor, R. W. P., and Burchell, H. B. *A.M.A. Arch. Int. Med.* **105:** 444 (March) 1960.

An analysis was made of survival and causes of death among 235 persons who had survived their first clinically diagnosed myocardial infarction by at least one month. Follow-up information was obtained concerning 224 (95 per cent) of these survivors. Among traced patients, the three-year survival rate was 68.8 per cent, the five-year survival rate 55.4 per cent, and the ten-year survival rate 29.2 per cent. Five-year survival rates in relation to the age of the patient at the onset of infarction and in relation to the sex of the patient were calculated and found to be more favorable in the younger age groups and in the men. Five-year survival rates in relation to the presence or absence of angina pectoris, hypertension and congestive heart failure prior to infarction were calculated, and these factors when present were found to have an unfavorable influence upon the prognosis. Whether the occupation was physically strenuous seemed to have little effect on survival. The degree to which the patient was able to resume pre-infarction activity appeared to be the best prognostic indicator. Necropsy was performed in 82 cases, or 65 per cent of those in which death was known to have occurred. On pathologic examination, 3 of the hearts proved not to have healed infarcts. Among the other 79, anterior location of the infarction was most common (52 per cent) and posterior infarction somewhat less frequent (42 per cent), whereas infarctions of the lateral wall and of the ventricular septum were uncommon (5 and 1 per cent). Subendocardial infarction was found in 54 per cent of the hearts, and transmural infarction in 46 per cent. The cause of death was primarily cardiac in 82 per cent of the 79 cases validated at necropsy. This group was divided among three major categories: 1) deaths due to myocardial failure, 2) deaths due to recurrent acute infarction, and 3) sudden deaths in which neither cardiac failure nor acute myocardial infarction was present. Recurrent acute myocardial infarction was the most frequent single cause of death in this series, but the two other categories had significant numbers also. (From authors' summary.)

SUBCUTANEOUS OSSIFICATION OF THE LEGS IN CHRONIC VENOUS INSUFFICIENCY.

Lippmann, H. I., and Goldin, R. R. *Radiology* **74:** 279 (Feb.) 1960.

Subcutaneous ossification of the legs is a frequent late complication in chronic venous insufficiency. A series of 60 cases is reported. The roentgenographic appearance of the ossifications varies according to the amount and extent of involvement: (a) Fine granular densities. (b) Delicate oval or cylindrical densities which may interlace and coalesce. These densities frequently show thin rims and lucent centers which may have a fine web-like pattern. (c) Heavy cords and sheets which may retain central lucent zones. Trabeculation can sometimes be demonstrated. The subcutaneous location of the ossifications can be demonstrated by laminagraphy, which shows no involvement of skin and underlying muscle. The ossifications are independent of veins. This is demonstrated by venography and examination of pathologic material. (From authors' summary.) The most common densities that can be confused with subcutaneous ossification are phleboliths. A phlebolith usually is more discrete and presents a smoother outline. It usually has a denser rim with a smaller central zone of lucency. Multiple phleboliths tend to remain discrete. Venography may assist in distinguishing them. Arterial calcifications are more linear, may show a double-tracked appearance, and appear in the deeper soft tissues of the leg. Myositis ossificans can be differentiated by its position in muscle. Careful evaluation of most other calcific densities and correlation with the clinical picture will lead to the proper diagnosis.

PHYSIOLOGY OF THE AGING SKIN.

Lorincz, A. L. *Illinois M.J.* **117:** 59 (Feb.) 1960.

Factors that bring about the appearance of aging in the skin are those due to exposure to sunlight and weathering and those due to senile changes. 1) The former depend upon the amount of radiant energy that has impinged upon the skin and upon genetic factors that determine the resistance or susceptibility of the skin to the damaging effects of radiation. Chronically weather beaten skin is characterized primarily by degenerative changes in the subpapillary connective tissue known as solar elastosis. This tissue is interspersed with narrow, elongated, tortuous, relatively basophilic, degenerate collagen fibers. In severe solar elastosis, the skin is inelastic and slightly yellow, and permanent wrinkles readily develop. There generally is accompanying telangiectasia of superficial blood vessels, atrophy of the dermal papillae, and flattening of the epidermis with thickening of the horny layer. Pigmentary changes take place and premalignant keratoses and various malignant neoplasms tend to develop in such skin. 2) The etiologic mechanisms that account for the aging of nonexposed skin still are unknown; we do not know the part played by the genetic and environmental history of the skin nor that played by vascular, endocrine and other senile changes. The findings of various studies with regard to aging skin are reviewed. Senile skin is more finely wrinkled, dry, and shiny than that of younger persons. It lacks the elasticity and turgor of normal skin. The lack of elasticity together with a loss of subcutaneous fat results in redundancy and coarse folding. Rather than being fitted in taut fashion over underlying tissues, senile skin exhibits diminished tension which appears to be correlated with a decrease in elastic fibers. Its resistance to stronger stretching probably is a function of the collagen. The superficial atrophic appearance and fine wrinkling of senile skin appear to depend more upon the flattening or atrophy of the dermal papillae than upon reduction of epidermal thickness or its reproductive ability. Aging seems to modify the epidermis and its various functions less than the dermis and cutaneous appendages. The amorphous ground substance of the dermis decreases while collagen fibers increase. The basement membranes between epithelial and endothelial structures and their connective tissue stromata become more conspicuous. The horny layer becomes dry and brittle, partly as a result of diminished water-holding ability. Involution of the sebaceous glands occurs following the menopause in women, and at about age 70 in men. Sweat secretion diminishes gradually; this becomes pronounced in both sexes after age 70. Apocrine secretion decreases earlier and more rapidly than eccrine secretion. The tendency is toward a diminution of body and scalp hair. Axillary hair is lost and pubic hair diminishes, the loss of the former occurring earlier and being more pronounced in women. Nail growth rates decline at about equal rates in both sexes. The time of graying of the hair depends largely upon genetic factors. Melanogenesis in pigmented nevi in elderly persons may cease. Small blood-vessel fragility in senile skin is increased and apparently is based upon degenerative changes in the supporting connective tissue surrounding the vessels. Vasomotor responses to temperature changes in aged skin are sluggish. Senile skin shows an enhanced diffusibility of substances injected into the dermis and greater susceptibility to the enhancement of the spreading that can be brought about by hyaluronidase. The reactivity of the skin in very old age to inflammatory stimuli, such as the application of adhesive tape or ultraviolet irradiation, is more readily elicited, although the intensity and duration of the reaction may be diminished. Application to the skin of preparations containing hormones at best will produce a trifling increase in hydration of the superficial atrophic papillae of the dermis. It is far better to accept the inevitability of changes in the skin and try to keep the pattern of facial wrinkling in a pleasant or character-rich distribution by keeping the facial expression that way.

PRIMARY HEMANGIOPERICYTOMA OF BONE. REVIEW OF THE LITERATURE AND REPORT OF THE FIRST CASE WITH METASTASES.

Marcial-Rojas, R. A. *Cancer* **13:** 308 (March-April) 1960.

This fifth case of primary hemangiopericytoma of bone, and the first with metastases reported in the literature, occurred in an 83-year-old woman. Upon examination a mass was

detected on the inner aspect of the left clavicle. The only symptom was pain in the left upper chest, neck, and left arm. Roentgenograms showed complete destruction of the medial half of the clavicle by a soft-tissue mass. The clavicle and adjacent portion of the sternum and soft tissues were resected. The tumor mass measured 6 cm. across, was delimited by a pseudocapsule, and on section was found to have replaced the medial half of the capsule. Microscopic examination showed the tumor to be composed of slitlike vascular spaces surrounded by fusiform, elongated cells resembling smooth-muscle cells. In other places these cells were rounded or ovoid, and sometimes they formed knoblike projections into the capillaries and occluded them. Bone was destroyed and replaced by tumor in many places. Other tumor sections showed the classic perivascular area of pericytes with epithelioid features in some. The bulk of the tumor in between these perivascular areas was composed of interlacing bundles of elongated cells resembling leiomyoblasts. Eleven months following resection, a roentgenogram showed multiple pulmonary metastases. The patient died six months after their discovery. The criteria for differentiating a benign from a metastasizing hemangiopericytoma are unreliable. It is suggested that the criteria used in evaluating leiomyoma and leiomyosarcoma be used in the evaluation of hemangiopericytomas. Wide excision is recommended for these tumors when they occur in soft tissues, to avoid local recurrence and opportunities for metastatic spread. The cases are few, but it appears that when located in a resectable bone, they should be treated surgically. When located in important weight-bearing bones, radiation therapy may prove beneficial.

PSEUDOADAMANTINE ADENOCARCINOMA OF SUBMAXILLARY GLAND.

Myer, I., and Shklar, G. *Cancer* **13:** 270 (March-April) 1960.

One case with metastasis is described. The structural pattern resembled that of ameloblastoma of the jaw with a peripheral border of deeply staining columnar cells and an inner stellate reticulum. In the primary tumor there was generalized regularity in cell size, shape and chromaticity, with few bizarre cell forms and few mitotic figures. As the lesion progressed and metastasized, the tumor retained the basic pattern but became more anaplastic in appearance. The inner stellate reticulum lost much of the stellate appearance, the cells becoming large and having more cytoplasm. They became more bizarre in appearance and had deeply staining nuclei. Mitoses became more numerous and bizarre figures appeared. In some areas the tumor appeared as a typical solid anaplastic type of adenocarcinoma. Roentgenograms suggested metastases to the lungs. Metastases to the forehead were shown by biopsy. Endocrine changes suggested metastases to the brain and pituitary gland. The clinical course differed from that of ameloblastoma but was consistent with that of adenocarcinoma of the salivary gland, including aggressiveness, local infiltration, and metastasis particularly to the lungs and skeletal system. The lesion therefore was interpreted as an adenocarcinoma of the submaxillary gland with metastases to the mandible, lungs and other tissues. These tumors must be considered malignant lesions.

FIBRINOLYSIN (PLASMIN) THERAPY IN ACUTE DEEP THROMBOPHLEBITIS. A CONTROLLED STUDY.

Moser, K. M.; Sulavik, S. B., and Hajjar, G. C. *Circulation* **21:** 337 (March) 1960.

Sixty-two patients with deep thrombophlebitis of less than ten days' duration were studied in an attempt to evaluate fibrinolysin therapy. Thirty "control" patients received heparin, as soon as the diagnosis was established, in a dosage of 75 to 100 mg. subcutaneously every six hours. Bishydroxycoumarin or Warfarin usually was administered simultaneously. Heparin was continued until the prothrombin time had remained in the range of 10 to 30 per cent for twenty-four hours. Ambulation was permitted approximately forty-eight hours after the acute phlebitic signs had subsided. After one day of ambulation, anticoagulant therapy was gradually reduced and discontinued within the next thirty-six hours. With the recurrence of phlebitic signs, the therapeutic regimen was reinstituted. The regimen used in

32 additional patients was the same, with the exception that they received an intravenous infusion containing 75,000 to 100,000 units of fibrinolysin over a period of three to four hours, as soon as they had been evaluated. If phlebitic activity persisted the following day, the patient received a second dose of 50,000 to 75,000 units over two to three hours. Ten patients had two infusions, the remainder only one. Comparison of the data for the two groups indicated that the addition of fibrinolysin to the therapeutic regimen led to more rapid clearing of the acute phlebitic episode and diminished the short-term incidence of phlebitis recurrence and pulmonary embolization. Post-phlebitic residuals were encountered with about equal frequency in both groups. Greater differences in therapeutic response were found between control and fibrinolysin-treated patients when analysis was limited to patients treated within five days of onset of thrombophlebitis. No firm conclusions could be drawn regarding the apparently favorable influence of fibrinolysin upon the long-term prognosis in phlebitic patients, but the data indicated that recurrence and embolization could be expected in both groups. Factors that are critical in determining the response to fibrinolysin include the following: 1) The diagnosis of thrombophlebitis must be well established. 2) Adequate dosage of fibrinolysin must be used. The acceptable dose is one that produces detectable plasma fibrinolytic activity in 90 per cent or more of patients. The dosage used in this study previously had been found to accomplish this, but it cannot yet be considered ideal. 3) The age of the thrombus is crucial in determining the success of thrombolysis. The fibrolytic drug must be administered before a thrombus has become organized. Rapid clearing was observed almost universally in patients treated within five days and in the majority of those treated between five and ten days. 4) The venous clot must be accessible to the fibrinolytic agent. 5) For optimum results, adequate anticoagulant therapy should be used simultaneously with fibrinolysin. Although fibrinolysin is not devoid of toxicity, the febrile response to it does not impair its application in the majority of patients with acute thrombophlebitis. Antihistamine prophylaxis is important in patients with underlying disorders that may be unfavorably affected by a short period of fever or chills. The fibrinolysin-anticoagulant dosage regimen used in this study cannot be taken as the ideal, since much more study will be required to establish the proper dosage. This study indicates that the first steps have been taken toward finding a safe and effective means of dissolving intravascular clots in man.

GLOMERULONEPHRITIS IN OLDER AGE GROUPS.

Nesson, H. R., and Robbins, S. L. *A.M.A. Arch. Int. Med.* **105:** 23 (Jan.) 1960.

That glomerulonephritis rarely occurs in adults is a widespread misconception. Among 11,157 necropsies, an 0.97 per cent incidence was found, and a 9.6 per cent incidence of acute and chronic pyelonephritis. The renal disease was a major factor in death in 76.8 per cent of the former group and in 29.8 per cent of the latter. Among 74 fatal cases studied in detail, over 70 per cent occurred in persons over the age of 40 years. The average age at necropsy in those with acute disease was 56.3, in the subacute group, 56, and in the chronic group, 44.5 years. Of the deaths from acute glomerulonephritis, 87 per cent occurred in patients above age 40 years. The distribution of chronic cases showed a biphasic curve with peaks at the third and sixth decades. Clinical and laboratory evidence showed hypertension to be present in 50 per cent of the patients, edema in 62 per cent, nitrogen retention in 84 per cent, and anemia in 82 per cent. The level of total protein was normal in the 33 cases in which it was determined. Increased albumin content and red and white blood cells were recorded at some time for almost all patients whose urines were examined. The diagnosis of glomuerulonephritis was made ante mortem in 55 per cent of the patients—in two-thirds of the patients with chronic or subacute disease but in only one-fourth of the patients with acute glomerulonephritis. Approximately half of the cases showed fairly characteristic acute onsets, some preceded by upper respiratory infections. The other half showed what appeared to be an insidious onset, and apparently accounted for many of the 20 per cent of fatal cases in which

there had been no diagnosis of renal disease. A misdiagnosis of pyelonephritis was made in 10 patients, of nephrosclerosis in 4, of chronic renal disease of unknown type in 5, and of no definitive renal disease in 14. In 45 per cent of the cases, there was at least one histologic diagnosis of concurrent disease of the kidney in addition to glomerulonephritis. The conclusion is reached that the classic clinical and laboratory findings that would indicate a diagnosis of glomerulonephritis in a child also may indicate the same diagnosis in an adult.

CERVIX UTERI UND LEBENSALTER. DIE BEDEUTUNG DER FORMWANDLUNGEN DER ZERVIX FÜR DIE KREBSDIAGNOSTIK UND DIE FRAGE DEN SOGENANNTEN PORTIOEROSION (UTERINE CERVIX AND AGE. SIGNIFICANCE OF CHANGES IN CERVICAL SHAPE FOR DIAGNOSIS OF CANCER AND SO-CALLED EROSION OF THE PORTIO).

Ober, K. G. *Deutsche med. Wchnschr.* **83:** 1661, 1958; through Excerpta med. (Gerontol. & Geriatrics) **2:** 534, 1959.

A study of the percental frequency of the main cervical types shows the following relations: In children, squamous epithelium grows into the cervical canal. During sexual maturity the frequency of this finding falls below 10 per cent. After the menopause, it rises again to 80 per cent. During sexual maturity there is ectropion in the first place (the cervical mucosa rests free on the surface of the portio), further covering of the cervical glands on the surface of the portio by squamous epithelium, and cases in which the squamous epithelium already penetrates into the cervical canal. In the various age groups, great differences in localization of incipient or manifest cancer are to be expected. In elderly women, intracervical carcinoma prevails from the first stages up to a stage of a tumor that can be macroscopically diagnosed. Cytology and colposcopy yield the principal data for recognizing early stages. In 85 per cent of all cytologically positive cases the diagnosis is verified by histologic examination. The author uses the following procedure: all gynecologic patients are examined cytologically unless bleeding renders this impossible. In suspicious cases, colposcopy and colpophotography are undertaken. When there is reason for the suspicion, conization is performed. The shape of the conus to be removed is determined by careful palpation and observation of the cervix. The cone must at least contain the inferior two-thirds of the gland-containing mucosa, and is histologically examined. If this leads to a diagnosis of cervical cancer, radical treatment is carried out. If a markedly atypical epithelium is found (carcinoma in situ), care is taken to see whether the resection has gone as far as the normal tissue. When this is the case, follow-up examinations, including simultaneous cytologic examinations are carried out at intervals of three months.

LIPOMA OF THE HEART. REPORT OF TWO CASES.

Pierce, E. C., and Bakemeier, R. E. *J. Indiana State M.A.* **53:** 294 (Feb.) 1960.

Upon gross examination these two tumors appeared to be well circumscribed but microscopically they were not, and there was no evidence of a capsule. Atrophic myocardial fibers were present throughout both, varying in amount from single fibers to groups of fibers. The conclusion is reached that the gross appearance of such tumors is of importance in diagnosis and that they should be classified as lipomas if they are well circumscribed, occur in a location where fatty tissue is unusual, have the typical lobulated appearance, and have the yellow coloration characteristic of lipomas. The presence of adipose tissue with strands of myocardial fibers, fibrous connective tissue, and blood vessels demonstrated on microscopic examination should confirm the diagnosis. The location of these lesions is variable. They may be subendocardial, subpericardial, or in the myocardium. They usually are small and sessile. In most instances they are asymptomatic. Both of those reported were discovered at necropsy.

THE USE OF L-LYSINE MONOHYDROCHLORIDE IN COMBINATION WITH MERCURIAL DIURETICS IN THE TREATMENT OF REFRACTORY FLUID RETENTION.

Rubin, A. L.; Spritz, N.; Mead, A. W.; Herrmann, R. A.; Braveman, W. S., and Luckey, E. H. *Circulation* **21:** 332 (March) 1960.

L-lysine monohydrochloride was administered to 14 adult patients with edema due to Laennec's cirrhosis or chronic congestive heart failure, and resistant to mercurial diuretics. Therapy was divided into 1) a control period during which no L-lysine monohydrochloride was given, 2) a period of administration of L-lysine monohydrochloride in a dosage of 10 Gm. four times daily for two to five days, during which hyperchloremic acidosis was produced, and 3) a period during which L-lysine monohydrochloride and meralluride were administered together. During period 2, significant weight loss did not occur. The plasma chloride concentration increased while the carbon dioxide combining power and the blood pH fell. An increase in urinary chloride concentration to 40 mEq. per liter or more was useful in indicating that responsiveness to administration of mercurials might be expected. No instance of hyperpnea or other symptom attributable to acidosis occurred. In period 3, the administration of a mercurial agent during the hyperchloremic acidosis that had been produced was associated with a significant weight loss in all patients. The L-lysine monohydrochloride was continued during mercurial therapy. The plasma chloride level reverted toward normal during the diuresis. Potassium depletion was prevented by the administration of potassium chloride. In most instances, the diuretic could be discontinued after the satisfactory clinical response. When it became ineffective in a few patients, the re-establishment of hyperchloremic acidosis was associated with further mercurial diuretic response and further loss in weight. Mild diarrhea was the only side-effect noted. Although many patients had advanced impairment of liver function, there was no instance of development of flapping tremor, mental change, or other significant clinical deterioration as a result of the administration of L-lysine monohydrochloride. Neither were evidences of renal or hematopoietic toxicity found upon urinalysis and hematologic studies. Caution should be observed in giving the substance to patients in whom increased peptic activity represents a risk. This method of producing hyperchloremic acidosis should be reserved for cases of refractory fluid retention, and be undertaken only in the hospital.

NORMALE ALTERSBEFUNDE IM RAHMEN DER MEDIZINISCHEN RÖNTGENDIAGNOSTIK IM BEREICH DES RUMPFES. (THE NORMAL ROENTGEN-DIAGNOSTIC CHANGES IN THE TRUNK INDUCED BY AGING).

Scherer, E., and Harrichhausen, K. H. *Neue Z. ärztl. Fortbild.* **2:** 28, 1959; through Excerpta med. (Gerontol. & Geriatrics) **2:** 545, 1959.

The vertical dimension of the chest increases, and its antero-posterior diameter starts to grow after the fourth decade. The diaphragm sinks lower after the second decade in the male, whereas in the female there is a tendency towards elevation, which reaches its maximum about seventh decade. There is a tendency towards ossification of the costal cartilages, especially of the first costal cartilage. This happens earlier in the male. The senile atrophy of the heart, so well known to the pathologist, does not show up on the x-ray films; on the contrary one observes an enlargement of the heart's shadow. This difference is due to the fact that whereas the roentgenologist observes the blood-filled heart in action, the pathologist sees an empty and collapsed heart. There may be calcifications of the coronaries and of the aortic and mitral valves. Calcification of the valves should be attributed to aging only if all other causes have been eliminated. There is lengthening and enlargement of the aorta; its walls may be calcified. After the age of 60, only about 10 per cent of persons show a normal aorta on roentgen examination. Calcification of other vessels is often seen. This calcification is of varied form and location, that is, in the intima, media or elastica interna. There is a progressive ossification of the cartilages of the larynx. The lungs show emphysema. Often there is an increased marking of the lungs, which is caused by increased pulmonary

pressure, some interstitial fibrosis, and chronic bronchitis. Of 308 cases of hiatus hernia, 76 per cent occurred in patients over 50 years of age. These were usually sliding hernias. Diverticulosis of the colon is an accidental finding in old age. There is also delayed emptying of the gall-bladder.

TREATMENT OF THE SKIN OF THE AGED.

Shair, H. M. *Illinois M.J.* **117:** 67 (Feb.) 1960.

Water is the only plasticiser of the skin, but in order for moisture to be retained by keratin an application of some kind of grease is necessary to retard evaporation. Plain oils and fats have a place as emollients of the skin. *Wrinkling.* Protegin-X, toilet lanolin, and various lubricating creams can be recommended. Fluorinated hydrocortisone lotion may be of benefit for wrinkling around the eyes. Dermal abrasion and plastic surgery are recommended for deep furrows. *Hair and scalp.* There is no contraindication to the dyeing of hair for grayness, provided there is no sensitivity to the dye used. Desensitization is not practical. For alopecia in women, which is increasing in extent, Premarin lotion or an antiseborrheic scalp lotion containing 8 to 16 mg. of diethylstilbestrol in each 8 ounces is applied daily. Itching of the scalp, which may indicate the thickening of lichen chronicus simplex, can be treated by superficial x-ray therapy and application of an antipruritic lotion with the addition of a small amount of 20 per cent podophyllum resin in compound tincture of benzoin for resistant cases. *Keratoses and leukoplakia.* After curettement of small or thin ketatoses, the lesions are painted with liquefied trichloracetic acid. For thicker keratoses, an anesthetic solution is infiltrated intradermally beneath the lesion. After it has been removed, the lesion is painted with trichloracetic acid, and electrodesiccated or electrocauterized. Gamma-ray therapy should not be used because the dosage needed to destroy keratosis is likely to leave a radiation scar. Cryotherapy with solid carbon dioxide or liquid nitrogen is satisfactory when used with skill. Trichloracetic acid or cryotherapy applied at intervals of a month or two can be used for benign lentigo (liver spot) on the face, hands, and forearms. Leukoplakia of the lip and intra-oral mucosa resembles senile keratosis. When thickened, it should be removed under topical and local anesthesia. A buccal tablet containing 75,000 units of vitamin A once daily is of benefit in the case of intra-oral and lingual leukoplakia. Biopsy of senile sebaceous adenomata of the face may differentiate them from basal-cell epitheliomata. The larger lesions may be excised with local anesthesia and electrodesiccation. *Senile pruritus.* Baths with starch, oatmeal or oil may be followed by the application of skin oil. Oral medications consist of preparations to control itch such as Temaril, Benadryl or Pyribenzamine, male sex hormone, or a combination of estrogen and androgen. *Perlèche.* Permanent cure usually depends upon increasing the distance between the maxilla and the mandible, either by procuring dental plates for those without teeth or lining dental plates to overcome the loss of space through shrinkage of the alveolar ridges. When indicated, vitamin B capsules or 5 mg. of riboflavin are given three times daily. Five per cent ammoniated mercury in zinc oxide ointment is applied topically and x-ray therapy given if healing is delayed. *Herpes zoster.* Measures for severe pain include radiation therapy to the ganglia involved, vitamin B_{12} (1,000 μg. for seven to fourteen days), 2.6 cc. of Protamide daily for a week or more, or a short course of corticosteroids. Locally a shake lotion (zinc oxide, talc, glycerin and water) or Lassar's paste may be applied. Uncontrolled pain will require neurosurgical consultation. *Foot problems.* Care by a chiropodist or orthopedist may be necessary. Otherwise the procedures to give comfort are peeling of corns and calluses, soaks in warm water, padding, and the application of foot powders and creams. Neutrophilic perforating ulcers of the foot, as occur frequently in diabetic patients, are treated by the long-term administration of antibiotics, paring the calluses around the ulcer, and the application of silver nitrate and antibiotic powders and ointments while continuing the treatment of any primary disease. *Leg ulcers.* The patient with a swollen, ulcerated leg should lie flat with the leg elevated and have dressings of boric acid solution applied four times daily followed by the painting on of a soothing lotion. Antibiotics are administered for infection.

When swelling has receded and the infection is under control, the leg is wrapped with a Unna-paste bandage after powdering with neomycin or painting with gentian violet solution, or packing with Gelfoam powder or sponge, or both. The bandage is removed after a week, and reapplied, if the area is healing, every two to four weeks until healing is complete. Thereafter, elastic stockings or bandages are worn. The boot is used for a patient with an arteriosclerotic ulcer only if it is tolerated. Preliminary judgment as to the use of proteolytic enzymes topically is not favorable. For generalized eczematoid dermatitis, as may occur in stasis dermatitis and ulceration, ACTH or cortisone may be necessary in addition to local treatment of the leg. A cream lotion containing hydrocortisone and antipruritic agents is applied topically. *Lichen sclerosus et atrophicus.* The senile vulva and the glans penis and prepuce may be affected by leukoplakia, lichen sclerosus et atrophicus, or kraurosis. Treatment is symptomatic. A reversal to normal skin cannot be expected. For lichen, the most effective medication is topical corticosteroid lotions. Other soothing lotions, anti-eczematous creams, and protective creams also are needed. Testosterone ointment is under trial in senile vulvitis. *Miscellaneous.* Arsenical therapy can be used more freely in the aged and sometimes is effective in chronic eczema, psoriasis, psoriatic eruptions of the scalp, hands and feet, dermatitis herpetiformis, and low-grade lymphoblastomata. The daily subcutaneous injection of 2 per cent sodium arsenate solution is preferred, starting with 1 minim and increasing daily by a minim until a dose of 16 minims is reached. This dosage is continued for a week or two until the dermatosis commences to involute, and then the dosage and frequency of injections are reduced over a few weeks until the patient is receiving 10 minims once weekly. For oral therapy, 1 part potassium arsenite solution is combined with 2 parts peppermint water to make 2 ounces. The dosage is 5 drops three times daily, with an increase of 1 drop per day to a maximum of 30 drops three times daily. Improvement should occur in three to four weeks, after which the dosage should gradually be reduced and terminated within three months of onset. Side-effects of arsenical therapy include gastro-intestinal upset, purpura, herpes zoster, exfoliative dermatitis and neuritis. In slowly progressive mycosis fungoides, Kaposi's sarcoma and pemphigus vulgaris, treatment should be adjusted to symptoms rather than to the disease. Massive-dose radiation, nitrogen mustard, and TEM should be avoided. Long-term administration of corticosteroids requires optimal supervision to avoid the complications of steroid therapy. Corticosteroids, however, should be used with proper supervision in progressive and potentially fatal dermatoses in the aged. Few cases of syphilis are seen. The treatment for late lues is 10 to 20 million units of penicillin over a period of three to four weeks. In the case of serious damage to the heart or blood vessels from syphilis, or in a space-filling gumma of the central nervous system, preparation with bismuth salicylate injections and saturated potassium iodide solution by mouth for a month prior to penicillin therapy may prevent the untoward complications of too rapid a cure. In such cases, and in nonsymptomatic aged syphilitic patients, specific treatment may be omitted.

COMMON SKIN DISEASES OF THE AGED

Slinger, W. N. *Illinois M.J.* **117:** 63 (Feb.) 1960.

Senile skin is subject to all of the skin diseases that affect younger adults and treatment is much the same. The most common are the following: *Pruritus.* Senility of the skin may never cause pruritus. Most frequently itching follows external irritation or internal disease. External irritation results from: 1) dryness associated with the low temperatures of cold weather which do not allow sebum to spread, 2) too frequent bathing, or 3) contact with garments that cause itching, such as wools. This type of pruritus usually responds to conservative measures like the use of soothing creams, and the avoidance of frequent bathing, temperature changes and woolen clothing. Among the common internal diseases that may cause itching of the skin without a primary lesion, arteriosclerosis is most common. Generalized pruritus also may be the first symptom of hepatitis, leukemia, diabetes, nephritis, tuberculosis, carcinoma or lymphoblastoma. Early mental degeneration also may be accom-

panied by itching. *Senile purpura.* The incidence is 2 per cent in the seventh decade and 25 per cent in the tenth decade. The lesions may be petechial or ecchymotic, of limited or wide distribution, and spontaneous or induced by friction, pressure or other trauma. The hemorrhages occur most commonly on the extremities. The color gradually fades to leave mottled areas of yellowish-brown pigmentation. The reason for senile purpura is obscure: there is no increased incidence of cardiovascular or hypertensive disease, no abnormality in vitamin C metabolism or excretion, no improvement upon administration of vitamin C, normal bleeding and clotting times, and normal findings with capillary resistance tests. The skin is extremely fragile and even minor trauma may result in an abrasion or fracture that heals slowly. *Stasis dermatitis.* Acute and chronic eczematous dermatitis of the leg, common in the elderly, is most often associated with edema-producing conditions. The dermatitis may exist for a long time without ulcer formation, and ulcers may occur in the presence of edema without eczematization but commonly these two accompany each other. Sometimes an auto-eczematization phenomenon is seen with an eczematous eruption elsewhere on the body which is morbilliform or lichenoid and pruritic. This disorder may occur suddenly and be accompanied by severe itching, chills, fever, malaise, lymphadenopathy, and occasionally enlargement of the spleen. *Eczemas.* Allergic eczematous dermatitis of the contact type is less common in older people than in persons of other ages. Examples of eczemas that are more common in the elderly include eczematous dermatitis surrounding a leg ulcer (stasis dermatitis), and infectious eczematous dermatitis around areas of acute or chronic suppurative lesions. These eruptions respond to medication administered topically or internally. *Genital lesions.* Kraurosis vulvae should be reserved as the term for "a sclerosing, progressive atrophy of the mucocutaneous teguments of the vulva, leading gradually to stenosis of the vaginal orifice, disappearance of the labia minora, frenulum and clitoris, and flattening of the labia majora." This disease is rare. Four common conditions of the vulval tissues are: 1) senile atrophy of the skin and mucous membranes, the skin being thin, dry, and occasionally vitiliginous; 2) localized neurodermatitis, or chronic lichenoid dermatitis, which may follow an acute cutaneous eruption of the vulval or perineal tissue or develop as pruritic lichenified plaques; 3) leukoplakic vulvitis, a hypertrophic process; leukoplakia, hypertrophic dermatitis, and senile atrophy may occur at the same time; and 4) lichen sclerosus et atrophicus which is characterized by whitish, flat-topped papules with a smooth and shining surface which shows one or more keratotic plugs. This disease usually is seen in young girls. It has been known to undergo spontaneous involution even in elderly patients. Common sites outside the genital area are the upper portions of the trunk, neck, arms and forearms. Of these vulval diseases, only leukoplakia is precancerous. It should be possible to avoid needless surgery if the characteristics of the diseases mentioned become familiar to the general practitioner as well as to dermatologists.

INTRA-ARTICULAR STEROID THERAPY WITH TRIAMCINOLONE ACETONIDE IN LOW DOSAGE.

Sperling, I. L. *Postgrad. Med.* **27:** 232 (Feb.) 1960.

Triamcinolone acetonide (Kenalog) in a dose of 4 to 20 mg. was injected intra-articularly from one to twenty times in 157 patients with various rheumatic disorders who suffered inflammatory involvement of a specific joint or supporting soft-tissue structures. Most of the patients had received local therapy with cortisone, hydrocortisone or tertiary-butyl acetate. The response was judged excellent when complete remission of joint symptoms occurred, good if residual symptoms were minimal, fair if some swelling, pain and impaired mobility remained, and poor if there was a total lack of improvement. On this basis the response was excellent or good in 136 (86.6 per cent) of the 157 patients. These favorable results were obtained in the peripheral joints ordinarily suited to such therapy: knee, shoulder, elbow, ankle, wrist, fingers and hip. Although response in the hip joint is difficult to obtain, the result was excellent in 1 case of degenerative arthritis of the hip, good in 1 case of synovitis and 1 case of severe osteoarthritis, and fair in 1 case of bursitis affecting

the hip. In more than half of the cases, triamcinolone acetonide produced greater subjective or objective improvement than did other intra-articular steroids. No systemic effects were observed. Untoward effects consisted of mild pain in 2 patients, a local reaction after a difficult injection, flushing and dizziness in 2 patients, and mild dizziness following treatment in 1 patient. It is concluded that triamcinolone acetonide is highly effective for intra-articular use in rheumatic disorders with local inflammation, pain, and stiffness in peripheral joints.

CHANGES IN THE BRAIN ASSOCIATED WITH SENILITY.

Wahal, K. M., and Riggs, H. E. *A.M.A. Arch. Neurol.* **2:** 151 (Feb.) 1960.

Necropsy records were reviewed for 3 groups of patients: (*a*) 15 with senile deterioration whose average age at death was 72 years, (*b*) 12 adult cardiac patients, and (*c*) 8 juvenile cardiac patients. Comparable areas of the brain were examined in each group. The results showed that senile mental disturbances may develop in the absence of focal infarctive lesions of the brain or occlusive disease of the cerebral arteries. Atheromatous vascular changes were prominent in many instances, but in equally well documented cases such deposits were absent or limited to occasional plaques which did not impinge upon the lumen. In this latter group, repeated or prolonged episodes of cardiac decompensation were a conspicuous feature of the clinical course. In the presence of cardiac disease complicated by repeated or prolonged episodes of decompensation, extensive cellular degeneration was found in the brains of relatively young adults and in children. This suggests that systemic cardiovascular insufficiency may be a factor in the development of neuro-anatomic substrata associated with senile mental states. A suggestion that cardiac as well as cerebral vascular disease may account for cellular degeneration in the senile brain is also found in the studies of several investigators cited. The presence of similar brain lesions in younger persons without overt psychologic disturbances suggests that functional disability may not depend directly upon neuro-anatomic alterations and may, therefore, be subject to arrest or reversal. Since in certain instances changes in the brain may be minimal and neural damage limited to the cellular level, a more dynamic approach to senile mental deterioration may be possible. Because of the relation of functional integrity of the nervous system to the nutritional and dynamic efficiency of its blood supply, giving attention to the physical status of a patient may offer a practical approach to prevention or amelioration of intellectual deterioration in the senium.

L'HYPERALDOSTÉRONISME SECONDAIRE AU COURS DE L'HYPERTENSION ARTÉRIELLE (SECONDARY HYPERALDOSTERONISM IN THE COURSE OF ARTERIAL HYPERTENSION).

Warter, J.; Schwartz, J., and Bloch, R. *Presse méd.* **68:** 1, 5–10, 1960; through Ciba Literature Review **5:** 118, 1960.

Increased aldosterone excretion was observed in 12 of 59 patients with essential hypertension of varying origin. The patients were confined to bed and were receiving a normal or moderate amount of salt in their food. Neither by clinical examination nor by determination of the 17-ketosteroids could the hypertensive patients with increased aldosteronuria be distinguished from the others. With one exception, there were no signs of overproduction of mineralocorticoids. Primary aldosteronism (Conn's syndrome) could not be detected in any of the patients. There is a correlation between aldosterone and sodium. Hypertensive patients, for example, excrete increased amounts of sodium, thus giving rise to reactive aldosteronism. In certain hypertensive patients moderate restriction of the sodium intake may be followed by increased secretion of aldosterone. In normal subjects, this occurs only following strict limitation of salt intake. Three practical conclusions may be drawn: 1) A hypertensive patient may react to a moderate degree of salt deprivation with aldosteronism. 2) This secondary aldosteronism may be dangerous in hypertensive patients kept on a strict

low-salt diet, inasmuch as sudden relaxation of the diet leads to marked sodium retention, to which aldosterone secretion takes time to adapt. 3) Strict criteria must be observed in the diagnosis of Conn's syndrome, since secondary aldosteronism is fairly common.

CARDIAC RUPTURE COMPLICATING MYOCARDIAL INFARCTION IN THE AGED. Zeman, F. D., and Rodstein, M. *A.M.A. Arch. Int. Med.* **105:** 431 (March) 1960.

In a series of 668 consecutive postmortem examinations of persons past the age of 63 years, 81 cases of acute myocardial infarction were found, among which there were 16 cases of cardiac rupture, including 1 rupture of a papillary muscle. The 15 cases with rupture through the left ventricular wall were compared with 62 cases with acute myocardial infarction without rupture as regards clinical course and pathologic findings. The 2.4 per cent incidence of rupture in the series and the 19.75 per cent incidence among the cases with acute myocardial infarction are among the highest reported in the literature. The average age of 80 years in patients with rupture makes it the oldest series to date. The average age of 78 in patients without rupture is also worthy of note. The groups differed, in that patients with rupture showed a greatly increased incidence of the condition itself, a greater preponderance of women, and less marked correlation with undue exertion after infarction, as well as more examples of preceding heart failure and of mental impairment. The high incidence of rupture in the aged, attributed by other observers primarily to the increased incidence of acute myocardial infarction in aged women is strikingly confirmed by this group of cases of advanced age. With acute infarction, aged women are particularly susceptible to cardiac rupture since, with a retarded age of onset of coronary artery disease, they lack the protective effects provided by the increased collateral circulation, the myocardial fibrosis, and the muscular hypertrophy which develop with long-standing coronary artery disease. The diagnosis of acute myocardial infarction in older persons is made more difficult and often missed in the absence of necropsies because of the frequent presence of complications or overshadowing associated diseases and because of the impaired sensitivity to pain secondary to changes in the sensorium. The necessity for a high index of suspicion of myocardial rupture as a complication of infarction in the aged is emphasized. The need for careful, conservative treatment of acute infarction in the aged is discussed with particular reference to the need for strictly limited activities and sedation, as well as for caution in the use of vasopressor drugs in the treatment of shock. In view of the suspicion that anticoagulant therapy may contribute to the development of cardiac rupture, it is noteworthy that no cases in this series were given such treatment. The suggestion is made that all mortality studies of myocardial infarction attempting to evaluate the effect of anticaoagulant therapy should include data on sex and age. (From authors' summary.)

NEWS AND NOTICES

COURSE IN REHABILITATION CARE OF THE CHRONICALLY ILL PATIENT

A one-week course for physicians, devoted to the rehabilitation care of the chronically ill patient, will be held *November 14–18, 1960* under the auspices of the Department of Physical Medicine and Rehabilitation, New York Medical College–Metropolitan Hospital Center. The course will offer a review of the principles and techniques in the medical care of the chronically ill to meet the needs of the clinician, medical administrator and public health physician. The course will include: Physiology and Pathology of Chronic Diseases, Nutrition and Dental Care, Management of Bedridden and Incontinent Patients, Home Care Programming, Community Needs and Resources, Public Health Aspects, Self-Care Activities, Prosthetic Devices and Psychological and Social Aspects.

The tuition fee is $150.00. Traineeships for tuition, maintenance and travel are available through funds provided by the U. S. Office of Vocational Rehabilitation. Applications for the course and traineeships can be obtained directly from Dr. Jerome S. Tobis, Chairman, Department of Physical Medicine and Rehabilitation, New York Medical College, 1 East 105th Street, New York 29, N. Y.